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Minima sensibilia

The Medieval Latin Debate (ca. 1250-ca. 1350) and Its Roots

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Minima sensibilia. Le débat latin médiéval (ca. 1250-ca. 1350) et ses racines

Minima sensibilia. The Medieval Latin Debate (ca. 1250-ca. 1350) and Its Roots

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PREFACE

All the manuscripts used in the thesis are always referred to with their complete shelfmark. A list of them is included also in the final bibliography. All the early modern printed sources used are referred to in an extended form both on the occasion of their first occurrence in the thesis and in the final bibliography. After their first mention, they are referred to only with the indication of the place and year of edition. All the critical editions of the sources used are referred to in an extended form both on the occasion of their first occurrence in the thesis and in the final bibliography. After their first mention, they are referred to only with the indication of the editor or editors.

Whenever quoting directly from manuscripts or from early modern printed sources, as a rule, I have respected their orthography, but I have resolved all abbreviations and normalised the punctuation according to standard modern usage. The symbols '<...>' indicate a proposed integration, the symbols '[...]' indicate a proposed expunction, the symbols '(...)' indicate an explanatory comment. The symbol '(?)' indicates that the preceding word represents a dubious reading.

The English translation of all the passages from Aristotle is taken (with slight modifications whenever needed) from J. BARNES (ed.), *The Complete Works of Aristotle. The Revised Oxford Translation (2 vols.) (Bollingen Series LXXI-2)*, Princeton, NJ, Princeton University Press, 1984. All the other English translations are my own, unless otherwise noted. The symbols '[...]' in the English translation of a passage indicate an explanatory comment.

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Having reached the completion of my PhD thesis, therefore, I would like to try to express my gratitude to all the people who made this work possible.

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On a personal level, all my gratitude goes to my wife, Isabella, who has been the best partner I could have imagined along this difficult journey and whose love goes beyond everything I could ever deserve in this life. To her I dedicate this thesis.

Finally, I would like to thank my parents for having always been there for me and for their constant and selfless encouragement to pursue my dreams.

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INTRODUCTION

0.1. Topic and Structure

This thesis focuses on the ways in which Medieval Latin commentators of Aristotle's *De sensu et sensato* 6, 445b3-446a20 analyse the issue of the infinite divisibility of sensible qualities, as accidental forms, according to the (potential) infinite divisibility of the matter of the material substance[1] in which they inhere (the so-called issue of *minima sensibilia*[2]), although it also touches upon the issue of the infinite divisibility of sensible qualities in themselves (i.e., in species within genera), the other issue briefly raised by Aristotle in the same text[3], both because Aristotle explicitly claims that they are connected[4], and because Medieval Latin commentators almost always treated them in conjunction.

This does not mean that the two issues were considered of equal importance by Medieval Latin commentators. Indeed, it is safe to say that the former, while commenting on *De sensu* 6, 445b3-446a20, commanded their attention to an extraordinarily higher degree than the latter, something which is not difficult to understand if one considers both its higher conceptual difficulty and the fact that the Aristotelian discussion in *De sensu* 6 is mostly devoted to it[5]. It should therefore not come as a surprise that the main body of

[1] By 'material substance' I intend both living and non-living beings, and both homogeneous and heterogeneous entities. Still, I restrict my analysis to material substances as opposed to artifacts (according to Aristotle's definition in *Physics* II.2, 192b12-15), which present specific issues lying outside the scope of this thesis. Moreover, as I make it clear throughout the thesis, when dealing directly with the infinite divisibility first of substantial forms and then of sensible qualities through the (potential) infinite divisibility of matter, therefore from Chapter 2 onwards, my analysis focuses, more specifically, on the problematic case of homogeneous material substances, leaving aside the almost uncontroversial case of living beings.

[2] The name of *minima sensibilia* has been introduced in modern scholarly literature (following a use adopted in Aristotelian commentaries at least since the first half of the 14th century) by Aurélien Robert in his pioneering article A. ROBERT, "John of Jandun on *Minima Sensibilia*", *Documenti e studi sulla tradizione filosofica medievale* XXV, 2014, pp. 365-402.

[3] The two issues are, nevertheless, very different: while the former requires consideration not only of sensible qualities themselves, but also of the substantial form and the matter to which they are united, the latter (which I will call, in this thesis, the issue of the *numerus specierum sensibilium*, or, for short, *numerus sensibilium*) can already be dealt with in the context of a study of sensible qualities.

[4] Cf. *De sensu et sensato* 6, 445b21-24. More precisely, Aristotle's claim is that with the solution to the issue of *minima sensibilia* also the solution to the issue of the *numerus sensibilium* will become clear. This claim, which has not received sufficient attention in the commentary tradition on the *De sensu* (as well as in modern scholarship) appears puzzling. Nevertheless, in Chapter 3 I will present what I believe is a brilliant hypothesis to explain why the two issues of *minima sensibilia* and of the *numerus sensibilium* are discussed together by Aristotle, an interpretation put forth by Aurélien Robert in ROBERT, "John of Jandun on *Minima Sensibilia*", *op. cit.*

[5] This is not to say that such a problem (i.e., the divisibility of sensible qualities in species within genera) is without importance, either intrinsically or from the point of view of how Medieval Latin commentators

the thesis will be concerned with the problem of the infinite divisibility of sensible qualities through the infinite divisibility of the matter to which they are united.

Before this problem can be meaningfully discussed (both in Aristotle and in his commentators), however, two preliminary sets of questions need to find a solution:

1. It is only because the matter of material substances (as an extended magnitude[6]) is continuous, and thus (potentially) infinitely divisible[7], that the problem of the infinite divisibility of sensible qualities through the division of matter does even arise. Indeed, Aristotelian sensible qualities, as accidental forms, are ontologically dependent on the material substance (i.e., the hylomorphic compound of matter and substantial form) in which they inhere. Nevertheless, it is not immediately clear how the property of infinite divisibility should be interpreted. Is it strictly equivalent to continuity, or, at the very least, is it directly implied by continuity? Moreover, is the notion of 'divisibility' appealed to merely conceptual (or mathematical), or rather "physical"? Or, more clearly (using a distinction frequently drawn upon by Medieval Latin commentators): does it concern a merely imaginative process of division or a "physical" separation of quantitative parts?

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discussed it. Indeed, throughout Chapters 3 and 4, I will show how this issue found a new life by being connected to the crucial issues of the metaphysics and the mathematics of the infinite on the one side and of the *intensio* and *remissio* of sensible qualities (i.e., the degrees of sensible qualities) on the other side.

[6] On the connection between the matter of material substances and extension in the Medieval Latin Aristotelian tradition, an aspect that will not be addressed directly in the thesis, see at least the important studies by Silvia Donati (for instance the following ones: S. DONATI, "La dottrina delle dimensioni indeterminate in Egidio Romano", *Medioevo* 14, 1988, pp. 149-233, EAD., *Materie und räumliche Ausdehnung in einigen ungedruckten Physikkomentaren aus der Zeit von etwa 1250-1270*, in J.A. AERTSEN, A. SPEER (eds.), *Raum und Raumvorstellungen im Mittelalter (Miscellanea Mediaevalia 25)*, Berlin-New York, NY, de Gruyter, 1998, pp. 17-51, EAD., *The Doctrine of* dimensiones indeterminatae *in the Commentary Tradition of the* Physics *in the XIIIth and in the Early XIVth Century*, in C.H. LEIJNHORST, C.H. LÜTHY, J.M.M.H. THIJSSEN (eds.), *The Dynamics of Aristotelian Natural Philosophy (Medieval and Early Modern Science 5)*, Leiden-Boston, MA-Köln, Brill, 2002, pp. 188-223, EAD., "Materia e dimensioni tra XIII e XIV secolo: la dottrina delle *dimensiones indeterminatae*", *Quaestio* 7, 2007, pp. 1-31). Note that I take as an uncontroversial background assumption that all the Medieval Latin commentators discussed in the thesis accept the claim that the matter of concretely instantiated material substances is extended and, more precisely, that it is an extended magnitude.

[7] The adjective 'infinite' might appear misleading, as has been frequently noted by modern scholars (already since G.L. CALISSE, "Divisibilità e Continuità", *Rivista di Filosofia Neo-Scolastica* 1 (3), 1909, pp. 430-441, and ID., "Divisibilità e Continuità (Continuazione)", *Rivista di Filosofia Neo-Scolastica* 1 (4), 1909, pp. 556-569). Indeed, since the 'infinite' referred to in this context is a 'potential' infinite, as it is almost exclusively the case in the Aristotelian worldview, it might seem more appropriate to characterise the notion of divisibility appealed to in this respect as an 'indefinite (or unlimited)', rather than an 'infinite', division. Yet, since the expression retained not only by Aristotle, but also by his Medieval Latin commentators, is always that of 'infinite divisibility', in order to avoid any possible confusion throughout the thesis I will maintain it. On this issue, cf. *infra*, Chapter 1.

2. As said, Aristotelian sensible qualities ontologically depend on a material substance to exist. To put it in other words, there is no free-standing 'red' in the Aristotelian worldview; there are, rather, only red objects, or, more precisely, red material substances[8]. Nevertheless, the direct ontological relation of sensible qualities is not with matter itself, but rather with a material substance as a composite of matter and

[8] Of course, this statement is an over-simplification: sensible qualities, in an Aristotelian sense, do not exist only in the material substance in which they inhere: instead, they have a (peculiar) kind of existence also in the medium (such as air and water) through which they reach the external senses and also in the sense organs themselves. Cf. especially *De anima* II.5 and II.12 and *De sensu* 3, 6 and 7. What this kind of existence of sensible qualities truly entails has always been at the centre of considerable debates in modern scholarship, especially for what concerns the existence of sensible qualities in the sense organs. The *crux* of the matter is whether such existence is taken as "material" (so that, for instance, the eye-jelly truly becomes red when perceiving a red object) or merely "intentional/spiritual" (so that, for instance, the form of red perceived by the eye-jelly does not change its colour). The former position, usually referred to as "literalist", has been first advocated by R.R.K. SORABJI, "Body and Soul in Aristotle", *Philosophy* 49 (187), 1974, pp. 63-89, while the latter, usually referred to as "spiritualist", found its most prominent advocate in M.F. BURNYEAT, *Is an Aristotelian Philosophy of Mind Still Credible? (A Draft)*, in M.C. NUSSBAUM, A.O. RORTY, (eds.), *Essays on Aristotle's* De anima, Oxford, Oxford University Press, 1995 [1992], pp. 15-26 and T.K. JOHANSEN, *Aristotle on the Sense-Organs (Cambridge Classical Studies)*, Cambridge, Cambridge University Press, 1997. Both Sorabji and Burnyeat developed their positions in a number of additional contributions (see for instance R.R.K SORABJI, *Intentionality and Physiological Processes: Aristotle's Theory of Sense Perception*, in NUSSBAUM, RORTY (eds.), *Essays on Aristotle's* De anima, *op. cit.*, pp. 195-226; R.R.K. SORABJI, *Aristotle on Sensory Processes and Intentionality: A Reply to Myles Burnyeat*, in D. PERLER, *Ancient and Medieval Theories of Intentionality (Texte und Studien zur Geistesgeschichte des Mittelalters 76)*, Leiden, Brill, 2001, pp. 49-61; M.F. BURNYEAT, "Aristote voit du rouge et entend un "do": Combien se passe-t-il de choses? Remarques sur *De Anima*, II, 7-8", *Revue philosophique de la France et de l'étranger* 183 (2), 1993, pp. 263-280, and ID., "*De Anima* II 5", *Phronesis* 47 (1), 2002, pp. 28-90). Additional arguments in favour of a "literalist" reading can be found in S. EVERSON, *Aristotle on Perception*, Oxford, Oxford University Press, 1997, which is criticised, on the "spiritualist" side, by J.E. SISKO, *Alteration and Quasi-Alteration: A Critical Notice of Stephen Everson, Aristotle on Perception*, in C.C.W. TAYLOR (ed.), *Oxford Studies in Ancient Philosophy 16*, Oxford, Oxford University Press, 1998, pp. 331-352. More moderate positions, which avoid the extreme implications of both "literalist" and "spiritualist" readings, can be found in J.M. MAGEE, "Sense Organs and the Activity of Sensation in Aristotle", *Phronesis* 45 (4), 2000, pp. 306-330 and, especially, V. CASTON, *The Spirit and the Letter: Aristotle on Perception*, in R. SALLES (ed.), *Metaphysics, Soul and Ethics in Ancient Thought: Themes from the Work of Richard Sorabji*, Oxford, Clarendon Press, 2005, pp. 245-320, which also provides a nice summary of the overall debate. The controversy is far from over and its implications not only for Aristotelian studies, but also for the study of Medieval commentators remain significant. A useful starting point in this respect are two works on the subject by Robert Pasnau. The first, R. PASNAU, "Sensible Qualities: The Case of Sound", *Journal of the History of Philosophy* 38 (1), 2000, pp. 27-40, as the title indicates, focuses on the problematic relation between sound, the medium through which it is transmitted, the motion it produces in the medium, and the way both affect the sense organ of hearing, for a number of Medieval (mostly) Latin Aristotelian commentators. The second one, ID., *Theories of Cognition in the Later Middles Ages*, Cambridge, Cambridge University Press, 1997, among many other topics, charts the "literalist"-"spiritualist" debate with respect to Aquinas (see esp. p. 42, n. 20, and ch. I.2). Additionally, important elements can be found in PERLER (ed.), *Ancient and Medieval Theories of Intentionality*, *op. cit.*; among the chapters collected in the book, a special mention deserves M.F. BURNYEAT, *Aquinas on "Spiritual Change" in Perception, ibid.*, pp. 129-153, where, interestingly, Aquinas is discussed not only (and mostly) in view of understanding his own position in the "literalist"-"spiritualist" debate, but rather as a deep interpreter of Aristotle. While the controversy as such will not be directly addressed in the thesis, I will point out all the issues on which it has some bearing throughout the work.

a substantial form. Therefore, the basic hylomorphic composition of matter and substantial form is to be correctly understood if one is to consider how the accidental forms of sensible qualities inhere in a material substance. More precisely, what is to be understood is whether substantial forms themselves are (potentially) infinitely divisible through the (potential) infinite divisibility of matter (the so-called problem of *minima naturalia*) and, if not, whether this prevents the (potential) infinite divisibility of sensible qualities through the (potential) infinite division of matter. Can the accidental form of red remain united to the matter of a stone even if the stone has lost its substantial form? And, conversely, can a stone retain its substantial form without the accidental forms that inhere in it?

Now, all the Medieval Latin commentators who discussed the issue of *minima sensibilia* accepted the belief that continuity implies (potential) infinite divisibility, and that, therefore, magnitudes are (potentially) infinitely divisible insofar as continuous, and the belief that the process of division concerned is not merely conceptual (or mathematical). Nevertheless, they did it with different nuances and specifities. Therefore, the first chapter of the thesis will serve the purpose of presenting Aristotle's discussion of the continuity and the (potential) infinite divisibility of magnitudes (as well as the arguments against atomism), focusing mostly on *Physics* V.3 and VI.1-2 and *De generatione et corruptione* I.2 and I.8. Moreover, the interpretations of these texts provided by Late Ancient commentators and by Averroes will be dealt with extensively, together with some paradigmatic cases exemplifying the positions of Medieval Latin commentators. In this way, it should be possible to obtain a sufficiently precise idea of the shared continuist framework against which Medieval Latin commentators of the 13th and the 14th century looked at the issue of *minima sensibilia*[9].

The main claim which will be argued for in the first chapter is that, due to this shared continuist framework, treating Medieval Latin discussions of Aristotelian *minima* as instances of atomistic or corpuscularian doctrines is a categorial mistake[10]: no

[9] This does not amount to a commitment to the claim that each and every Medieval Latin commentator fully agreed with all the presuppositions which will be laid out in the first chapter. This should rather be taken as a default framework, departures from which will be duly noted when needed.

[10] This point has been made forcefully, in recent literature, especially in B. PABST, *Atomtheorien des lateinischen Mittelalters*, Darmstadt, Wissenschaftliche Buchgesellschaft, 1994, esp. pp. 272-276, where the critical targets are the "traditional" histories of atomism in Western thought by A.G.M. VAN MELSEN,

discussion of the (potential) infinite divisibility of forms can even begin if one takes matter to be composed of indivisible magnitudes[11]. Rather, my belief, which will be argued for extensively in the course of the thesis, is that Medieval Latin commentators discussed *minima sensibilia* as an issue pertaining to the general problem of the persistence through division[12] of the properties of material substances considered as hylomorphic compounds (and *minima naturalia* as an issue pertaining to the persistence through division of material substances themselves)[13]. This change of perspective is, I

Van Atomos naar Atoom. De geschiedenis van het begrip Atoom, Amsterdam, Meulenhoff, 1949, and E.J. DIJKSTERHUIS, *De Mechanisering van het Wereldbeeld*, Amsterdam, Meulenhoff, 1950. Even recently, however, some histories of atomism, such as A. PYLE, *Atomism and Its Critics: From Democritus to Newton*, Bristol, Thoemmes Press, 1992, continue to fall prey to such a categorial mistake, mostly due to their reliance on the two "traditional" histories of atomism just mentioned, especially the one by van Melsen. Note that, throughout the thesis, I understand the distinction between atomism and corpuscularianism in a rather loose way. My understanding of the distinction follows the one that has been effectively summarised in the Introduction to C.H. LÜTHY, J.E. MURDOCH, W.R. NEWMAN (eds.), *Late Medieval and Early Modern Corpuscular Matter Theories (Medieval and Early Modern Science 1)*, Leiden, Brill, 2001: "The primary difference between the two concepts [i.e., atomism and corpuscularianism] lay [*sic!*] in the fact that corpuscles need not be indivisible in order to have explanatory power, whereas the term atom, as its etymology suggests, carries the connotation of indivisibility in some sense" (*ibid*., p. 12).

[11] This is not to deny the importance of Medieval Latin atomism, whose weight and pervasiveness as a doctrine has only been recently recognised, especially thanks to the fundamental and tireless work conducted in this respect by Aurélien Robert and by Christophe Grellard (cf. especially C. GRELLARD, A. ROBERT (eds.), *Atomism in Late Medieval Philosophy and Theology*, Leiden, Brill, 2009, and also A. ROBERT, "Atomisme et théologie au Moyen Âge", *Annuare de l'École Pratique des Hautes Études (EPHE). Section des Sciences Religieuses* 124, 2017, pp. 253-260, and ID., "Atomisme et théologie au Moyen Âge (II)", *Annuaire de l'École Pratique des Hautes Études (EPHE), Section des Sciences Religieuses* 125, 2018, pp. 301-310; to all these it should also be added the recent volume ID., *Épicure aux Enfers. Hérésie, atomisme et hédonisme au Moyen Âge*, Paris, Fayard, 2021). Nevertheless, what these works have contributed to show (which goes in the direction of my claim) is that Medieval Latin atomism was, first and foremost, a mathematical doctrine whose sources are mainly Platonic and Pythagoreans (with the important contribution of Boethius' *De arithmetica*) and whose growth, especially in the 14th century, is (almost always) inextricably linked with the attempt to develop mathematical models of atomism which only derivatively (sometimes) found application in the physical world. Aristotle has never been considered by Medieval Latin commentators of the 13th and the 14th century as a thinker whose writings could have been taken as supporting atomistic or corpuscularian doctrines. Still, it is important to remark that the whole debate on Aristotle's notion of the continuity of magnitudes in the Latin 13th and 14th century took on an increasingly geometrical character, something which will be addressed specifically in Chapter 1.

[12] Intended as the "physical" separation of the quantitative parts of a material substance from the whole to which they belong.

[13] This conceptual framework is taken, it goes without saying, from contemporary analytic ontology and it is, admittedly, an anachronism. Nevertheless, I think that it can be employed effectively in order to provide a precise idea of the theoretical direction of this thesis, a direction, of course, which will be detailed, discussed and argued for exclusively on a textual basis in the course of the thesis. A fundamental source of inspiration for the notion of 'persistence through division' in contemporary analytic ontology has been the notion of 'persistence through change' employed in S. HASLANGER, "Persistence, Change, and Explanation", *Philosophical Studies: An International Journal for Philosophy in the Analytic Tradition* 56 (1), 1989, pp. 1-28. Interestingly, Haslanger claims that her own strategy to discuss the problem of persistence through change, especially that of the persistence of objects through the acquisition or loss of properties, is "in a loose sense Aristotelian" (*ibid*., p. 1). The importance of the topic of persistence through change in contemporary analytic ontology is testified, moreover, also by a recent collection of essays co-edited by Haslanger: S. HASLANGER, R.M. KURTZ (eds.), *Persistence: Contemporary Readings (MIT*

believe, a fundamental element of novelty and of originality of my thesis, one which should also help to bring to the fore of studies in the Medieval Latin Aristotelian tradition the general issue of the persistence through division of material substances and of their properties. Still, as it will become clear especially in Chapter 3 and Chapter 4, this does not mean that I take the issue of *minima* (both *naturalia* and, especially, *sensibilia*) to be extraneous to the Medieval Latin history of atomism and corpuscularianism. Not only, as I will show below, discussions of *minima* sometimes offered commentators the opportunity to engage directly with Democritean atomism (given the criticisms of it contained in the Aristotelian texts related to *minima*), and, conversely, Medieval Latin "atomistic" thinkers, such as Nicholas of Autrecourt (and later John Wyclif), appropriated the notion of *minima* (*naturalia*) to put it to use in an atomistic framework, but, what is more, in the case of *minima sensibilia*, for reasons that will be explained in the course of the thesis, especially from the beginning of the 14th century onwards it is possible to

Readers in Contemporary Philosophy - A Bradford Book), Cambridge, MA, The MIT Press, 2006. The utmost attention must be brought, concerning this subject, in distinguishing the issue of the persistence through change of an object from the separate (albeit interconnected) one of the persistence through time, which is particularly prominent, among others, in the discussion on personal identity and which is the central concern of the collective volume just quoted (and which found an important reception also in the Latin Middle Ages, especially starting with the early 14th century). For what concerns the issue of persistence in Aristotle, discussions in recent literature are not lacking, but they tend to focus on the mere problem of persistence of objects through time (i.e., their identity conditions over time): cf. especially A. CODE, "Aristotle's Response to Quine's Objections to Modal Logic", *Journal of Philosophical Logic* 5 (2), 1976, pp. 159-186, ID., "The Persistence of Aristotelian Matter", *Philosophical Studies: An International Journal for Philosophy in the Analytic Tradition* 29 (6), 1976, pp. 357-367, M. FURTH, "Transtemporal Stability in Aristotelian Substances", *The Journal of Philosophy* LXXV (11), 1978, pp. 624-646, G.B. MATTHEWS, *Accidental Unities*, in M. SCHOFIELD, M. NUSSBAUM (eds.), *Language and Logos*, Cambridge, Cambridge University Press, 1982, pp. 223-240, ID., *On Knowing How to Take Aristotle's Kooky Objects Seriously*, paper presented at the Pacific Division meeting of the APA, Portland, March 27th, 1992, and J. BOWIN, "Aristotle on Identity and Persistence", *Apeiron* 41 (1), 2008, pp. 63-88. Significantly, though, S. O'CONNOR, "On Persistence in Aristotle", *Ergo* 5 (20), 2018, pp. 540-573 has recently remarked that a separate question about persistence which needs study in Aristotle is what he calls the "Survival Question", i.e., the question "that asks why substances are not destroyed as they change" (*ibid*., p. 540; this lexical peculiarity is not proper to O'Connor: Andrew Arlig, for instance, distinguishes carefully between 'persistence through time' and 'survival through change' in discussing Latin Medieval theories of persistence: cf. A. ARLIG, *Medieval Mereology*, in E.N. ZALTA (ed.), *The Stanford Encyclopedia of Philosophy*, URL: https://plato.stanford.edu/archives/fall2019/entries/mereology-medieval/, 2019, last consulted on January 31st, 2023). In particular, he focuses on the explanatory role that hylomorphism plays in eliciting an Aristotelian answer to such question. Of course, there are also studies which focus – at least partially - on the issue of persistence through change in Latin Aristotelian commentators of the 13th and 14th century, such as R. PASNAU, *Metaphysical Themes 1274-1671*, Oxford, Clarendon Press, 2011, esp. pp. 662-688, but also pp. 689-704, although more specifically dealing with persistence through time, and H. LAGERLUND, *Material Substance*, in J. MARENBON (ed.), *The Oxford Handbook of Medieval Philosophy (Oxford Handbooks)*, Oxford, Oxford University Press, 2012, pp. 468-485. Nevertheless, none of these studies connects the issue of persistence with that of *minima* (either *naturalia* or *sensibilia*) and the same is true of the studies primarily devoted to such *minima* themselves.

witness the emergence of a "corpuscularian" trend concerning the ultimate mereological structure and the production of the sensible qualities that we are able to perceive. All these developments, however, can be properly understood (and their historical importance properly evaluated) only if one starts from the presupposition that the Medieval Latin debate on *minima* (both *naturalia* and *sensibilia*) is not, at heart, to be read within the theoretical framework of atomism or corpuscularianism, but rather within that of the persistence through division of material substances and of their sensible qualities.

Although all the Medieval Latin *De sensu* commentators that I will discuss can be defined as continuists, significant differences emerge with respect to the issue of *minima naturalia*, i.e., of the divisibility of substantial forms through the division of the matter they inform. Since, in this case, there is no common answer in the 13th and the 14th century, the second chapter of the thesis, after an analysis of the relevant Aristotelian texts, will try to reconstruct in some detail the set of solutions to the problem presented during the 13th and the 14th century (ca. 1250-ca. 1350) by Medieval Latin commentators, with an eye to the main claims of Late Ancient commentators and of two key thinkers of the Islamic world, Avicenna (whose discussion of *minima naturalia*, however, did not directly reach the Medieval Latin world) and Averroes. The reason to devote a chapter of this thesis to *minima naturalia* is not only, as mentioned above, because of the conceptual implications that such solutions had on the issue of *minima sensibilia*; rather (and contrary to a view recently put forward by John Murdoch[14]), this is also due to the fact that a

[14] Cf. J.E. MURDOCH, *The Medieval and Renaissance Tradition of* Minima Naturalia, in LÜTHY, MURDOCH, NEWMAN (eds.), *Late Medieval and Early Modern Corpuscular Matter Theories*, *op. cit.*, pp. 91-131, p. 128: "Yet two texts in Aristotle are cited most often in medieval authors as having some bearing on *minima naturalia*. The first is from the beginning of chapter 6 of the *De sensu*. Here, Aristotle raises an aporia whether or not sensible qualities are, like bodies, infinitely divisible. Yet most medieval authors realize that in his discussion of this puzzle Aristotle maintains their divisibility and even, towards the end of chapter 7, declares that no perceptible is indivisible. Consequently, this particular text is, at bottom, not concerned with *minima naturalia* or even with their medieval interpretation as *minima sensibilia*." The statement seems quite bold; yet, when detailing examples of the Medieval authors who allegedly recognise that the discussion of *De sensu* 6 concerning *minima sensibilia* bears no relevance with respect to *minima naturalia* Murdoch simply refers to q. 19 of Buridan's *Quaestiones supra librum De sensu et sensato* (in the Lokert edition of 1518), calling it "paradigmatic", in this respect (*ibid*., n. 105). Now, although it is certainly true that 14th-century commentators of *De sensu* 6 (and, more to the point, of *Physics* I.4) tend to keep the issue of *minima naturalia* distinct from the one of *minima sensibilia*, this is only because the influence of *De sensu* 6 on *minima naturalia*, as analysed in *Physics* I.4, had already been recognised in the previous century, to the point of becoming a common presupposition of the discussion. In Chapter 2 of the thesis, indeed, I will show how much, and in what way, *De sensu* 6 influenced 13th-century commentators discussing the issue of *minima naturalia* in *Physics* I.4. Moreover, the idea that Medieval commentators, even 14th-century ones, thought that Aristotle held sensible qualities to be infinitely divisible *simpliciter*, or that they argued in this sense, is a serious misrepresentation of the Medieval debate on *minima sensibilia*, one which will be rectified in Chapters 3 and 4 of this thesis.

significant number of Medieval Latin commentators viewed the discussion of the infinite divisibility of sensible qualities that Aristotle conducts in *De sensu* 6 as relevant (and, sometimes, even crucial) to the solution to the issue of the infinite divisibility of substantial forms. Therefore, any discussion of Medieval Latin commentaries on *De sensu* 6 that does not consider the influence of this text on the debate concerning *minima naturalia* cannot but be severely incomplete.

It is only at this point that, in Chapters 3 and 4, the text of *De sensu* 6, 445b3-446a20, and its interpretations by Medieval Latin commentators (again, in the period ca. 1250-ca. 1350, Chapter 3 covering the period ca. 1250-ca.1300 and Chapter 4 covering the period ca. 1300-ca. 1350), with an eye also to Late Ancient ones and to Averroes' one, will be specifically analysed with a view to discuss the debate on *minima sensibilia*. The chapters will make it possible to understand the richness and intrinsic interest of this debate not only for the specific solutions brought forth by commentators concerning the *aporia* raised by Aristotle in the text, but also for their relevant implications for Medieval Latin understandings of the overall ontology and epistemology of sensible qualities. Indeed, in the Aristotelian worldview, sensible qualities are defined by the proper operation of acting on the external senses, so as to provide the "raw material" of any process of (sensible) knowledge. Therefore, the issue of the (potential) infinite divisibility of sensible qualities according to matter raises a fundamental epistemological question, i.e., that of the "threshold of perceptibility". More precisely, is it the case that sensible qualities, even when they are united with extremely small portions of matter, are still able to act on the external senses, or is there a threshold below which sensible qualities are too "weak" to produce any effect on them? This question has a fundamental import for the overall shape of any Aristotelian theory of perception, since the possibility to maintain the "co-extension" between the sensible world and the perceptible one depends on its answer. Of course, this epistemological question raises, in turn, a further ontological concern: admitting that sensible qualities can exist on their own without being able to act on the external senses, is it still possible to consider them 'sensible' qualities at all, or do they *ipso facto* lose their essence by losing their proper operation? The chapters will thus provide the opportunity to deal extensively with the – especially – Medieval Latin solutions to these ontological and epistemological questions. Moreover, they will also allow to mention all the most relevant innovations concerning Medieval Latin discussions

of the issue of the *numerus sensibilium*, which, in their turn, contain important elements related to Medieval Latin conceptions not only of the criteria to identify the number of species within each genus of sensible qualities, but also, apparently more surprisingly, to the metaphysics and the mathematics of the infinite on the one hand and to the *intensio* and *remissio* (that is, the intensive degrees) of the accidental forms of sensible qualities on the other.

0.2. Methodology

To develop the intellectual itinerary that I have briefly sketched throughout this Introduction, from the methodological point of view I will work at three levels. At the philological one, I will provide an extensive catalogue of Medieval Latin manuscripts from the 13th to the 15th century containing *De sensu* commentaries, to be included as an Appendix to the thesis. As I will explain below, I do not take this as a mere "ornamental" addition to the thesis, but rather as a fundamental task of it, preliminary to any possibility to meaningfully analyse the contents of these same commentaries. Indeed, Medieval Latin *De sensu* commentaries of the 13th and of the 14th century have mostly been neglected by scholars until very recent years, and, as a result, only five complete critical editions of them have come to light until now, and two more commentaries are available in early modern printed edition. Most Latin *De sensu* commentaries from this period are only preserved in a single manuscript witness. As a result, one might easily get the impression that the Medieval Latin commentary tradition on the *De sensu* was rather limited, and mostly represented by a few commentaries of extreme significance. Nevertheless, the available catalogues of Medieval Latin Aristotelian commentaries list, for the period between the 13th and the 15th century, at least 80 surviving commentaries to the *De sensu*, preserved in more than one-hundred manuscript witnesses – and this is a conservative estimate. Of them, as I will show below, 31 (counting separately the various versions of commentaries attributed to the same masters, which frequently present important doctrinal differences) can be safely ascribed to the period ca. 1250-ca. 1350. While focusing exclusively on printed texts would have forced me to look at no more than seven of these commentaries, by taking into consideration the textual witnesses of all the 31 commentaries I have been able to provide a much stronger textual basis for my thesis.

More than that, as I will show below, contrary to a prejudice that is still sometimes felt among scholars of Medieval philosophy, it is not at all the case that anonymous commentaries, even the briefest and less detailed *reportationes*, cannot add anything of significance to the study of the Medieval Latin commentary tradition on a given topic. In the case of *minima sensibilia*, indeed, a large part of the anonymous commentaries (not all of them, of course) are explicitly discussed in the thesis insofar as they present interesting elements of originality or, in any case, insofar as they allow to better measure the emergence and the reception of important theories adopted in more developed and theoretically rich commentaries. Indeed, it is one of the main methodological principles that I have adopted throughout the thesis that even when commentaries do not add much of original to the debate on *minima sensibilia* they can (and indeed, in many cases do) still represent important terms of comparison to test the apparent novelty and originality of many positions appearing in celebrated commentaries by famous masters. The unflinching application of this principle has allowed me to discover, as I will show throughout the thesis, that even the most daring innovations in the Medieval Latin debate on *minima sensibilia* were frequently the result of a progressive development carried out by a collectivity of tight-knit masters working together, in the same period and in the same intellectual context of the Faculty of Arts and frequently responding to each other more than to their predecessors. If one followed the same methodological principle, I believe, in many other cases (even in some of the most studied ones) the apparent "innovations" of some protagonists of Scholastic Aristotelian natural philosophy would appear to be more part of a largely continuous process of intellectual development than sudden discontinuities breaking a supposedly "lethargic" commentary tradition.

At the doctrinal level, I will provide a close reading of published and (especially) unpublished Medieval Latin commentaries on *De sensu* 6, 445b3-446a20 of the 13th and the 14th century, in many cases (especially for the commentaries available only in manuscripts and, frequently, in a single manuscript witness) providing the first study of the relevant parts of these texts. This aspect calls for another digression. Indeed, the sheer length of the thesis (especially of Chapters 3 and 4, dealing directly with *De sensu* commentaries) might at first surprise and maybe make an unfavourable impression on the reader. Still, at a closer look it should become clear that the length of the thesis is an unavoidable consequence of the method I have chosen to follow. Indeed, working mostly

on unedited and previously unstudied texts (in the case of Chapters 3 and 4), and, even in the case where edited texts are largely available, with a very scarce amount of secondary literature, and especially with a virtual lack of in-depth studies of the positions of individual texts and authors (in Chapter 2 and at least in the last part, the one dealing with Medieval Latin commentators, of Chapter 1) I have been forced to remain as close to the texts as possible, to quote sometimes extensively and to always present the details of the arguments used in them before (and in addition to) providing interpretations of the theories and positions presented by them. I am fully aware of the drawbacks and pitfalls of such a method, but I also believe that the advantages it allows to achieve, in a case such as mine, far outnumber them. To name but a few: my method of close textual analysis has allowed me to recognise in a significant number of cases direct or indirect influences among commentaries, sometimes with important implications in terms of the dating of the commentaries themselves; it has been possible to study the progressive appropriation of arguments initially pertaining to other areas of Scholastic Aristotelianism in natural philosophy (this is especially the case with two arguments drawn from Averroes' *Long Commentary* on the *Metaphysics*); I have been able to bring to the fore individual differences between positions that seemed to be shared by different authors (or, at least, which were considered to be shared by different authors in the available secondary literature); and so on. I do not add anything else to the list, and to this *excusatio* more generally, since, ultimately, it is my research itself that provides the best justification of the method that I have followed, and I therefore leave it to the reader to judge my choice after having reached the end of the thesis.

At a wider conceptual level, finally, I will draw some important implications of my thesis for more general issues that at some point became entangled with the issue of *minima sensibilia* (and of hylomorphic *minima* more generally). This is for instance the case of innovative conceptions of substantial change as a temporally extended process and of the causal efficacy of substantial and accidental forms. The very fact that such topics, admittedly at the centre of Scholastic Aristotelian metaphysics and natural philosophy, come to the surface while discussing the issue of *minima sensibilia* (and that of *minima naturalia*) is by itself evidence to the fact that such a debate is far from representing a marginal aspect of Scholastic Aristotelianism. Rather, as I believe (and as I will better explain in the Conclusions of the thesis), it represents a fundamental focal

point where the most important assumptions underlying the conceptions of the hylomorphic structure of material substances converge. In this sense, I hope that my thesis will prove valuable not only to scholars interested in the history of Aristotelian *minima*, in Medieval theories of perception and understandings of sensible qualities, and in the debate on continuity and (potential) infinite divisibility, but also, more widely, to scholars interested in having a thorough understanding of the intimate details of Scholastic hylomorphism.

0.3. Periodisation

One final word should be added concerning two overall methodological issues that connote this thesis.

The first one concerns the *period* that I have chosen to focus on: indeed, it might be wondered why the period ca. 1250-ca. 1350 is a more appropriate choice to study the Medieval Latin debate on *minima sensibilia* than the period ca. 1200-ca. 1400, or even the period ca. 1200-ca. 1500, or than any other option available in the literature. Evidently, I believe, there are important doctrinal reasons for any study focusing on the global reconstruction of a topic of Scholastic Aristotelian natural philosophy (at least for topics discussed within Aristotelian commentaries) to choose this timeframe rather than another one, be it shorter or longer. These reasons are connected with some wider historical circumstances related to the fact that it is only around 1250 that, thanks to the new 1255 Statutes of the Parisian Faculty of Arts (and thanks to the first production, around the same years, of independent commentaries on Aristotle's *libri naturales* at Oxford), Scholastic Aristotelian natural philosophy started to assume a recognisable physiognomy, whereas it is around 1350 that such a physiognomy, after having undergone major theoretical changes (related to the general evolution of Scholastic thought), chrystallised in a new configuration (one whose consideration requires a whole new set of premisses). Of course, I am well aware of the possible objections to these general considerations, objections that, however, I do not want to discuss in this context, inasmuch as I do not need to argue for a general historiographical thesis concerning the most appropriate periodisation for the study of Scholastic Aristotelian natural philosophy. Indeed, be it as it may for other topics, in the case of *minima sensibilia* (and of

hylomorphic *minima* more generally) it is utterly clear that the period ca. 1250-ca. 1350 corresponds to the period between the emergence of the first theoretically recognisable doctrines put forth by commentators (around ca. 1250) and the "standardisation" of a set of answers that so radically modify the debate so as to mark the end of a phase of it and the beginning of a different one (around ca. 1350). The timeframe of my thesis, therefore, has been decided *a posteriori* and, what is more, it has been determined on the basis of the contents of the sources themselves, rather than on the basis of any methodological presupposition.

0.4. Sources

The second overall methodological issue to mention in this context concerns the *kind* of texts that I have chosen to discuss in the thesis. Indeed, focusing almost exclusively on Medieval Latin commentaries on Aristotle's *libri naturales* is, in many ways, an unavoidable choice in order to trace the development of specific topics of Scholastic Aristotelian natural philosophy. Nevertheless, one should not conclude that these texts are the only ones where the topics I analyse (and most topics of Scholastic Aristotelian natural philosophy more generally) are discussed.

Indeed, first of all, especially for what concerns the second part of the period I cover in the thesis, i.e., for the first half of the 14th century, the discussion of the topics analysed in this thesis (especially those linked with continuity and potential infinite divisibility, but also, partially, those concerning *minima*) starts to take place in independent treatises (or *summae* of natural philosophy, or even encyclopaedic works), rather than in commentaries to Aristotle. This is especially the case, as it is well known, at Oxford's Merton College, where the so-called *calculatores* produced, during the first decades of the 14th century, a number of important treatises concerning the issues of continuity and (potential) infinite divisibility, and not only. Thomas Bradwardine's *Tractatus de continuo* and Adam of Wodeham's *Tractatus de indivisibilibus*[15] are two cases in point. While, of course, I do believe that taking into consideration these texts would have been beneficial to the thesis, I also believe that these treatises would have

[15] Available in critical edition as ADAM DE WODEHAM, *Tractatus de indivisibilibus (Synthese Historical Library 31). A Critical Edition with Introduction, Translation, and Textual Notes by* R. WOOD, Dordrecht, Kluwer Academic Publishers, 1988.

needed a separate consideration, insofar as they present a unitary analysis and, what is more, they are also part of a larger debate concerning indivisibilism whose reconstruction goes well beyond the purposes of the thesis, whereas at the same time, usually, they do not engage specifically with the issues of *minima sensibilia* and of *minima naturalia* (I mention an exception concerning John Dumbleton's *Summa logicae et philosophiae naturalis* in Chapter 2).

Partially similar considerations also apply to other kinds of Scholastic texts. Indeed, the notion of *minima* plays an important role also in the medical and in the alchemical tradition in the Latin Middle Ages. Nevertheless, it might be questioned to what extent the notion is used in the same way in such contexts as it is in the texts discussed in the present thesis. It is exactly for this reason that I have deemed preferable not to discuss medical and alchemical texts in the thesis, insofar as their use of the notion of *minima* would certainly deserve a separate (and comprehensive) study[16].

A different set of considerations is in order, instead, concerning the Scholastic theological literature. Indeed, throughout the thesis I will make quite a significant number of references to the Scholastic theological literature, both in terms of *Sentences* commentaries and of *Quodlibeta*. This literature, indeed, contains a significant number of discussions (and rather in-depth ones, in some cases – Scotus' discussion of continuity and of *minima* in the second Book of his *Ordinatio* representing the most important case in point) of the issues I focus on in the thesis. This should not come as a surprise: contrary to another prejudice that is still sometimes felt in the literature, Scholastic thelogians, being fully formed in Aristotelian natural philosophy, made a significant use of its conceptual tools whenever they deemed it worth to clarify the issues they were considering (a trend that becomes paramount after Scotus). This is especially the case, for what concerns issues of continuity and of *minima*, of the issue of angelic motion (and, preliminary, of angelic place), an issue that, unsurprisingly, gives rise to Scotus'

[16] For the uses of the notion of *minima* in texts from the 12th-century medical school of Salerno, see D. JACQUART, Minima *in Twelfth-Century Medical Texts from Salerno*, in LÜTHY, MURDOCH, NEWMAN (eds.), *Late Medieval and Early Modern Corpuscular Matter Theories*, *op. cit.*, pp. 39-56. For the uses of the notion of *minima* in the Medieval Latin (and Renaissance) alchemical tradition, see William Newman's contribution in the same volume (W.R. NEWMAN, *Experimental Corpuscular Theory in Aristotelian Alchemy. From Geber to Sennert*, in LÜTHY, MURDOCH, NEWMAN (eds.), *Late Medieval and Early Modern Corpuscular Matter Theories*, *op. cit.*, pp. 291-329).

discussion of continuity and of *minima*[17]. But this is by no means the only issue relevant to discussions of *minima* in the theological literature of the 13th and the 14th century. Just to quote a few more examples, Giles of Rome mentions the topic of *minima* in connection with the issue of the number of angels in his commentary on *Sentences* Book II[18]; Peter of Auvergne discusses the topic of *minima* in connection with the issue of the infinity of God's power in the first article of the first *quaestio* of his first *Quodlibet*[19]; Richard of Middleton, significantly, devotes the fifth *quaestio* of his third *Quodlibet* entirely to the issue of *minima naturalia*[20].

What is even more interesting is that, usually, the treatment of *minima* (and of continuity) in theological literature seems to be well aware of the previous and contemporary debate taking place among *magistri artium* and it also, conversely, seems

[17] The literature on the Medieval Latin debate on angelic place and motion in *Sentences* commentaries of the 13th and the 14th century is rather extended, and I cannot summarise it exhaustively here. For some important general introductions, see the relevant contributions in the two very important collective volumes T. SUAREZ-NANI, M. ROHDE (eds.), *Représentations et conceptions de l'espace dans la culture médiévale/Repräsentationsformen und Konzeptionen des Raums in der Kultur des Mittelalters (Scrinium Friburgense 30)*, Berlin, de Gruyter, 2011 and T. SUAREZ-NANI, O. RIBORDY, A. PETAGINE (eds.), *Lieu, espace, mouvement: physique, métaphysique et cosmologie (XIIe-XVIe siècles) (Textes et Études du Moyen Âge 86)*, Barcelona-Roma, Fédération internationale des Instituts d'études médiévales (FIDEM), 2017, which situate the debate in the wider context of Medieval Latin discussions of space and movement in the Aristotelian tradition. To these, one should at least add the relevant chapters of T. HOFFMANN (ed.), *A Companion to Angels in Medieval Philosophy (Brill's Companions to the Christian Tradition 35)*, Leiden, Brill, 2012, and of I. IRIBARREN, M. LENZ (eds.), *Angels in Medieval Philosophical Inquiry: Their Function and Significance*, London, Routledge, 2008 (to which one should also add the considerations contained in T. SUAREZ-NANI, *Les anges et la philosophie: Subjectivité et fonction des substanes séparées à la fin du XIIIe siècle (Études de philosophie médiévale)*, Paris, Vrin, 2002). Concerning the very important changes that conceptions of angelic place (and, correlatively, of angelic motion) underwent after the Parisian condemnations of 1277 (which also contributed to motivate the depth and originality of Scotus' discussion), see especially P. PORRO, *Il luogo sotto processo: la condanna del 1277 e il problema della localizzazione delle sostanze separate nel XIII secolo*, in D. GIOVANNOZZI, M. VENEZIANI (eds.), Locus-spatium*: XIV Colloquio internazionale, Roma, 3-5 gennaio 2013*, Firenze, Leo S. Olschki, 2014, pp. 195-219. Concerning, specifically, the issue of the localisation of angels, it is also important to mention the recent volume with the French translation (and an important introduction) of four *quaestiones* on the issue by Henry of Ghent, Matthew of Acquasparta, Richard of Middleton and Peter John Olivi in HENRI DE GAND, MATTHIEU D'AQUASPARTA, RICHARD DE MEDIAVILLA, PIERRE DE JEAN OLIVI, *Les anges et le lieu. Textes latins introduits par* T. SUAREZ-NANI, *traduits et annotés par* T. SUAREZ-NANI, O. RIBORDY, G. EVANGELISTA, G. LARDELLI, P. SCHULTHEISS *(*Translatio. *Philosophies Médiévales)*, Paris, Vrin, 2017. I leave aside the numerous contributions focusing on individual authors and texts.

[18] Cf. AEGIDIUS ROMANUS, *In II Sententiarum (Pars Prima)*, Venetiis, apud Franciscum Zilettum, 1581, d. III, art. II, contra, f. 190ra: "Praeterea, infinitas se tenet ex parte materiae: finitas autem ex parte formae. Ideo omnium corpora sunt divisibilia in infinitum, quia hoc consequuntur ex materia, sed omnium natura constantium est certus numerus, et ratio eorum magnitudinis et augmenti, quia hoc consequuntur ex forma; quare si infinitas se tenet ex parte materiae, ubi non est dare materiam non est ponere infinitatem. Huiusmodi sunt angeli, ergo etc." (the punctuation, here as in all subsequent quotations of early modern printed works, has been modified according to standard modern usage).

[19] For a discussion of this text, see Chapter 2.

[20] For a discussion of this text, see Chapter 2.

to have exerted an influence on it (the case of Scotus being, again, the most relevant one). This might suggest that, at least in the case of *minima* (and of continuity), the philosophical and theological debates of the second half of the 13th century and of the first half of the 14th century were not "compartimentalised", but, rather, were part of a single space of discussion[21].

All these considerations could make one question why I do not provide a thorough discussion of the theological literature relevant to the issue of *minima* (and of continuity) in the present thesis. The answer is, first and foremost, that such a discussion would have required the space and the energy of (another) thesis. More than that, however, there is also a problem of scope. Indeed, the theological debate of the period ca. 1250-ca. 1350 is certainly rich of considerations regarding continuity, (potential) infinite divisibility and *minima naturalia*. Yet, there are far less considerations that are relevant to the issue of *minima sensibilia* in its own right. In this sense, it would have seemed unjustified to provide a thorough reconstruction of a debate that, at least at the presence state of research, seems to be able to contribute mostly in an indirect way to the main subject of this thesis. As a result of these considerations, while I certainly hope to be able to conduct a thorough analysis of the theological debate on *minima* (and on continuity) in the future (and also to connect its results with the ones that I have achieved in this thesis), I cannot do it here. What I have chosen to do, more modestly, is to discuss a set of the theological texts that either have such an importance in the history of the philosophical debate on *minima* (and on continuity) that they cannot be left out of a study devoted to it (this is most prominently the case of Scotus), or that can help improving the understanding of this philosophical debate itself, or even merely contribute to fill a void into it for the periods where the relevant Aristotelian commentaries are lacking or extremely few in number.

[21] On this issue, see especially J.E. MURDOCH, *From Social into Intellectual Factors: An Aspect of the Unitary Character of Late Medieval Learning*, in J.E. MURDOCH, E.D. SYLLA (eds.), *The Cultural Context of Medieval Learning. Proceedings of the First International Colloquium on Philosophy, Science, and Theology in the Middle Ages – September 1973 (Boston Studies in the Philosophy and History of Science 26)*, Dordrecht, Reidel, 1975, pp. 271-339. Note that an important research project on this issue (focusing on the period 1300-1330 and on specific issues of hylomorphic doctrine) is currently being carried out by Russell Friedman at KU Leuven under the title "Studying Medieval Hylomorphism Whole: Hylomorphic Theory in Intellectual Context. 1250-1400".

CHAPTER 1

The Continuity of Magnitudes and Their (Potential) Infinite Divisibility in Aristotle and in His Late Ancient and Medieval Commentators

1.1. Introduction

The belief in the continuity of magnitudes is the main element of the overall theoretical framework of the Medieval Latin (and, for that matter, Late Ancient and Medieval *tout court*) debate on *minima*, both *naturalia* and *sensibilia*. Indeed, as already mentioned in the Introduction, it is exactly from the effort to reconcile Aristotle's continuitist physics of magnitudes with the discrete structure of forms (both substantial and accidental) that the debate on *minima naturalia* and on *minima sensibilia* stems. More precisely, the *crux* of the matter, for commentators, consisted in understanding how to reconcile the property of (potential) infinite divisibility associated with continuous magnitudes with the idea that their substantial and accidental forms, insofar as they are discrete entities, do not share such a property.

Understanding, therefore, what is the precise meaning of the property of (potential) infinite divisibility in Aristotle and in his commentators, and what is its connection with the property of continuity, becomes a fundamental preliminary task in a thesis devoted to the Medieval Latin debate on *minima sensibilia*. It is exactly such task that I will carry out in this chapter, by first looking at how the notion of the continuity of magnitudes and that of their (potential) infinite divisibility are articulated in the most important Aristotelian passages discussing them, then considering how such passages were interpreted by Late Ancient commentators, by Averroes, and by a set of particularly representative (at least for the present thesis) Medieval Latin commentators.

It might be objected taht such a lengthy and detailed chapter is not necessary in a thesis that is not ultimately concerned with continuity and (potential) infinite divisibility in themselves, especially considering the fact that relevant secondary literature concerning these notions in Aristotle and in the Late Ancient and Medieval commentary

tradition is certainly not lacking[22]. Still, when one looks at this literature, it becomes rather clear that points of controversy abound, and not only concerning minor details, but even regarding the fundamental understanding, in Aristotle as in his commentators, of the notion of the continuity of magnitudes and of that of their (potential) infinite divisibility. Just to mention a few examples (which are especially relevant for the Medieval Latin debate on *minima naturalia* and on *minima sensibilia*, and which I have already partially mentioned in the Introduction): is continuity defined by (potential) infinite divisibility? What is the difference between the continuity and the (potential) infinite divisibility of geometrical magnitudes and that of "physical" ones? Are there specific conceptual limits to (potential) infinite divisibility? How is the *sui generis* notion of potency associated with (potential) infinite divisibility, i.e., that of a potency that can never be actualised, best understood?

All these, and many more aspects, do not only represent points of contention in contemporary studies, but they did so since the early stages of the commentary tradition that, in Late Antiquity, started to reflect on the Aristotelian texts concerning continuity and (potential) infinite divisibility. This was certainly due, in part, to the intrinsic obscurity of some of the key Aristotelian passages concerned, but also to the creativity that, also in connection with changing doctrinal needs and influences, characterised the Aristotelian commentary tradition since its very beginning. Investigating, therefore, the doctrine of the continuity of magnitudes and of their (potential) infinite divisibility in Aristotle and in (some of) his Late Ancient and Medieval commentators represents not only a much needed task for the present thesis, but also, I believe, a contribution with a historical and doctrinal value in its own right.

1.2. Aristotle on the Continuity of Magnitudes and Against Atomism

The belief that magnitudes (together with motion and time) are continuous is a pervasive one in Aristotle. It would probably take an entire thesis to delve into all the passages which, in the Aristotelian *corpus*, from the *Categories* to the natural works to the *Metaphysics*, detail such belief and present arguments in favour of it and against the

[22] See all the relevant secondary literature quoted throughout the chapter, in correspondence with each specific topic.

alternative explanations of the constitution of the material world given before Aristotle. Such an enterprise is, it goes without saying, completely beyond the scope of the present thesis[23]. In what follows, instead, I will discuss a set of carefully chosen passages which, taken together, make it possible to understand the main implications of Aristotle's defence of the continuity of magnitudes for the main topic of this thesis, i.e., the divisibility of the accidental forms of material substances, considered as hylomorphic compounds. In this respect, a few preliminary clarifications are in order.

[23] For a general overall introduction to Aristotle's theory of continuity, a fundamental starting point remains W. WIELAND, *Die aristotelische Physik. Untersuchungen über die Grundlegung der Naturwissenschaft und die sprachlichen Bedingungen der Prinzipienforschung bei Aristoteles*, Göttingen, Vandenhoeck und Ruprecht, 1970. Although I think that Wieldan's analysis is rather careful in the exegesis of the Aristotelian passages that I will discuss below, there are some aspects of Wieland's analysis on which I disagree. I discuss the relevant cases as part of the discussion of the aspects of Aristotle's theory of continuity to which they refer. Important studies on specific aspects of (or texts related to) continuity in Aristotle abound in recent literature. One very useful starting point is the collective volume edited by Norman Kretzmann: N. KRETZMANN (ed.), *Infinity and Continuity in Ancient and Medieval Thought*, Ithaca, NY, Cornell University Press, 1982, which gathers important contributions not only on Aristotle's defence of the 'continuity thesis' and, correspondingly, his refutation of atomism, but also on the reception of such thesis in Late Ancient commentators and in the Medieval Latin world. Extremely important contributions (albeit ones that arose many controversies) may also be found in D. BOSTOCK, *Space, Time, Matter, and Form: Essays on Aristotle's Physics*, Oxford, Oxford University Press, 2006. The volume contains, among other essays, a most helpful introduction to the crucial discussion of the 'continuity thesis' in *Physics* VI.1-2. Although, in what follows, I will criticise some of Bostock's interpretation, my debt towards his text remains significant. A volume which, instead, focuses on the broader context of Aristotle's 'continuity thesis', both in terms of his interlocutors and of the reception it received in Late Ancient world, is R.R.K. SORABJI, *Time, Creation, and the Continuum. Theories in Antiquity and the Early Middle Ages*, Ithaca, NY, Cornell University Press, 1983. Another interesting contribution in this respect, which focuses on the early reception of Aristotle's 'continuity thesis' in the first generations of the Peripatetic school, is S. BERRYMAN, *Continuity and Coherence in Early Peripatetic Texts*, in I. BODNÁR, W.W. FORTENBAUGH (eds.), *Eudemus of Rhodes (Rutgers University Studies in Classical Humanities XI)*, New Brunswick, NJ, Transaction Publishers, 2002, pp. 157-169. A very different perspective is, instead, the one taken by White, which tries to interpret Aristotle's 'continuity thesis' (among other ancient theories on the constitution of the material world) from the point of view of modern mathematics and physics: M.J. WHITE, *The Continuous and the Discrete: Ancient Physical Theories from a Contemporary Perspective*. Oxford, Clarendon Press, 1992. A more pointed contribution in the same direction is ID., "On Continuity: Aristotle versus Topology?", *History and Philosophy of Logic* 9 (1), 1988, pp. 1-12. A trend which is particularly noteworthy in recent literature on Aristotle's notion of continuity is the one which tries to put this concept in relation to other aspects of Aristotle's philosophy. For instance, I. DE RIBERA-MARTIN, "Unity and Continuity in Aristotle", *Apeiron* 50 (2), 2017, pp. 225-246, shows how the notion of physical continuity plays an important role in *Metaphysics* H and Θ in the context of distinguishing the various degrees of unity in composite substances. Going in a different direction, K.W. SHATALOV, "Continuity and Mathematical Ontology in Aristotle", *Journal of Ancient Philosophy* 14 (1), 2020, pp. 30-61, reassesses the most problematic relation between physical and mathematical continuity in Aristotle and shows that, if the same notion of continuity is to be applied both to physical and to mathematical objects (as the relevant Aristotelian passages seem to suggest), then Aristotle must be committed to a certain kind of fictionalism about the ontology of mathematical objects (such as those defended by Phil Corkum and Jonathan Lear), on pain of inconsistency. Of course, this does not claim to be an exhaustive list in any way. Contributions relevant to the specific issues discussed in this chapter will be mentioned in later footnotes.

Firstly, since the claim that motion and time are continuous is logically independent from the claim that magnitudes are[24], in what follows I will focus exclusively on the passages which concern Aristotle's claim that magnitudes are continuous. This should not, however, be taken as evidence that I think that the continuity of magnitudes in Aristotle (or, for that matter, in any Late Ancient and Medieval commentator) can be discussed in isolation from the continuity of motion and of time, but simply that it is possible to consider the arguments Aristotle presents for the continuity of magnitudes without having to deal also with those specific to motion and time[25].

Secondly, in the selection of the passages of interest (both for Aristotle and for his commentators), I will focus mostly on two natural works, i.e., the *Physics* and the *De generatione et corruptione* (and commentaries thereon). The reason is quickly stated: it is quite evident, as it will be shown below, that the discussion of the continuity of magnitudes (and the refutation of alternative conceptions, such as atomism) contained in

[24] At most, in Aristotle, it is rather the case that the continuity of motion and, derivatively, that of time, is entailed by the continuity of the (geometrical) extension over which motion takes place, and therefore, insofar as such extension can be considered a (geometrical) magnitude, on that of magnitude itself. The claim that magnitude, motion and time share the same physical structure is what is usually referred to by scholars as Aristotle's "isomorphism thesis" (see for instance F.D. MILLER., JR., *Aristotle against the Atomists*, 1982, in KRETZMANN (ed.), *Infinity and Continuity in Ancient and Medieval Thought*, *op. cit*., pp. 87-111, pp. 102-104), and it is a fundamental aspect not only of Aristotle's own analysis of continuity, but even of those of his commentators, as I will frequently point out in this chapter. The thesis is stated clearly by Aristotle in *Physics* VI.1, 231b18-20, and it holds also *e contrario*: that is, if someone is committed to the atomic structure of magnitudes, according to Aristotle, he must necessarily be committed to that of the motion which takes place over that magnitude and of the time in which such motion takes place (cf. *Physics* VI.1, 232a18-22). Moreover, in *Physics* VI.1, 231b19-232a23, Aristotle clearly takes the continuity of magnitude as a premiss in an argument to show the continuity of motion and, consequently, also that of time. This, however, should not be taken as Aristotle's definitive word on the matter: for instance, in *Physics* VI.2, 233a13-22, Aristotle presents an argument which shows how, by assuming the continuity of time, one can logically derive as a conclusion also the continuity of magnitude (and of motion). This seems to suggest that the 'isomorphism thesis' is best read as a logical co-implication, rather than a mere implication: if one assumes the continuity of any of the three objects under consideration (i.e., magnitude, motion and time) one must necessarily hold also the continuity of the other two, and vice versa if one denies the continuity of any of the three objects, one must also deny the continuity of the other two. Although the 'isomorphism thesis', in the form just presented, seems to be undeniably supported by a wealth of Aristotelian passages, it is important to keep in mind that there are passages which are difficult to reconcile with it, and which seem to show some theoretical oscillations in this respect. Cf., for instance, *Physics* V.3, 226b24-27, where Aristotle says quite clearly that it is possible for objects to move continuously in a discontinuous time. Whatever the truth of the matter, such ambiguities lie fully outside the scope of this chapter, which focuses exclusively on the thesis of the continuity of magnitudes (and of their potential infinite divisibility) in Aristotle and in his Late Ancient and Medieval commentators.

[25] For what concerns the issue of the continuity of time (but also with important remarks on the continuity of magnitudes and motion) in Medieval Latin Aristotelian commentators (and not only), the fundamental reference point is P. PORRO, *Forme e modelli di durata nel pensiero medievale. L'*aevum*, il tempo discreto, la categoria* quando *(Ancient and Medieval Philosophy – Series 1, 16)*, Leuven, Leuven University Press, 1996.

these two works is conceptually complete and self-contained: no particular reference to other works is needed to make sense of the arguments presented in the *Physics* and in the *De generatione* or even to supplement them. Therefore, it should be considered methodologically safer (and structurally better) to limit the present survey of Aristotle's discussion of the continuity of magnitudes to the *Physics* and the *De generatione*[26]. Still, I will always test the results of my analysis (both for Aristotle and for his commentators) against the views on continuity contained in two other works, the *Categories* and the *Metaphysics*, to provide additional support to my claims.

Thirdly, the main competing view that Aristotle faces in the discussion of the continuity of magnitudes is atomism. Interestingly, Aristotle's opinion concerning atomism is rather positive: Leucippus and Democritus are often praised (from a methodological point of view) for their attempt to make their explanations of the constitution of the material world compatible with perceptual evidence and, more in general, with human experience[27]. Moreover, atomism is praised for its ontological parsimony: two principles, atoms and void, are sufficient to explain all the kinds of natural changes which Aristotle analyses[28]. The undeniable fact that Aristotle held atomism in high esteem makes it all the more important for him to be able to refute such a view. Only in this way it is possible to explain the wealth of arguments, and the constant insistence with which Aristotle rebuts the atomists' claims[29]. This consideration should lead one to reflect carefully before attributing either to Aristotle himself or to any Late ancient or Medieval Aristotelian commentator the label of "atomist" or "corpuscularian", or to claim

[26] Of course, relevant passages from other Aristotelian works will be quoted when needed.

[27] Cf. especially *De generatione et corruptione* I.8, 325a23-26, referring specifically to Leucippus, and, referring to the atomists in general, *ibid*., 325b13-15. Cf. also, albeit less explicitly, *De generatione et corruptione* I.2, 315b9-10.

[28] Cf. in particular *De generatione et corruptione* I.8, 324b35-325a2.

[29] A simple look at the list of passages concerning atomism in the Aristotelian *corpus* will prove this claim. Aristotle discusses Leucippus' atomism at least in all the following passages: *De generatione et corruptione* I.1, 314a21, I.8, 324b35, *De caelo* I.7, 275b29, *De caelo* III.2, 300b8, *De anima* I.2, 404a1 and *Metaphysics* A.4, 985b4; Democritus' atomism, instead, prominently features in all (and not only) the following passages: *Physics* I.5, 188a2, II.4, 195b36, *ibid*., 196a24, *ibid*., 196b5, III.4, 203a33 VI.1, 251b16, *De generatione* I.2, 315a34, *ibid*., 316a1, *ibid*., 316a13, I.7, 323b10, I.8, 326a9, *De caelo* I.7, 275b29, III.4, 303a25, III.7, 305b1, IV.6, 313a21, *Meteorologica* I.8, 345a25, II.3, 356b4, II.7, 365a1, *De anima* I.2, 404a27, I.3, 406b15, I.5, 409a32, II.7, 419a15, *De sensu* 2, 438a5, 4, 442a29, *ibid*., 442b11, *De respiratione* 4, 471b30, *Historia animalium* 1, 623a30, *De partibus animalium* I.1, 642a24, III.4, 665a30, *De generatione animalium* II.4, 740a13, *ibid*., 740a33, II.8, 747a29, IV.1, 764a6, IV.4, 769b30 and V.8, 788b9; *Metaphysics* A.6, 1071b31, Γ.5, 10009b7, Z.13, 1039a9. To all these testimonies, one should also add a fragment which is reported by Aristotle in *De caelo* III.8, 307a17. As it should be clear, it is not only the sheer number of passages that testifies to the importance of atomism for Aristotle, but also the number and variety of contexts and works in which such a doctrine is recalled.

that it is possible to find traces of such doctrines in the positions upheld by Aristotle or by his Late Ancient and Medieval commentators, as it has become quite common in recent secondary literature[30].

With these brief remarks, it is now possible to turn directly to the discussion of the Aristotelian theory of the continuity of magnitudes.

1.2.1. The Definition of 'Continuity' in the *Categories* and in the *Metaphysics*

The notion of 'continuity' in Aristotle can be formally defined as a property pertaining to the category of 'quantity'[31]. It is thus in the discussion of such notion in the

[30] A very significant case in this respect is certainly constituted by Ruth Glasner's notion of "Aristotelian atomism", coined with reference to the supposed "atomistic" doctrine concerning the composition of motion and magnitude allegedly developed by Averroes in his commentaries on Aristotle's *Physics* and *De generatione et corruptione* (cf. R. GLASNER, *Averroes' Physics: A Turning Point in Medieval Natural Philosophy*, Oxford, Oxford University Press, 2009). Another important case in this respect is Christoph Lüthy's use of the expression "Aristotelian corpuscularianism" with reference to 15th- and 16th-century commentaries on *Meteorologica* Book IV and, more specifically, to their influence on Renaissance theories of mixture, such as that of Julius Caesar Scaliger (cf., for instance, C.H. LÜTHY, "An Aristotelian Watchdog as Avant-Garde Physicist: Julius Caesar Scaliger", *The Monist* 84 (4), 2001, pp. 542-561). Lüthy's remarks, however, do not extend to the 13th and the 14th century, and, therefore, they can easily be left aside in this thesis. Suffice it to underline that the notion of "Aristotelian corpuscularianism", if it has any application at all, is certainly much more appropriately used with reference to Renaissance Aristotelianism, which operated in a generally different intellectual landscape than 13th- and 14th-century Scholastic Aristotelianism.

[31] A preliminary question which would need an answer is whether the notion of 'continuity' can be understood completely outside of (and independently from) a hylomorphic framework.

Categories[32] that it is possible to find some first elements to put 'continuity' in focus[33]. In chapter 6 of the *Categories*, indeed, which deals specifically with the category of

[32] There is a significant debate, in modern scholarship, concerning the authenticity of this introductory and "scholastic" work, something which is, evidently, important for establishing how to deal with cases of theoretical discrepancies between this work and the rest of the Aristotelian *corpus*. However, since my main focus is on Medieval interpretations of Aristotle, and since the *Categories*, far from being considered inauthentic, were considered the fundamental introduction to Aristotle's thought throughout the Latin Middle Ages, I leave this issue aside. For a classical introduction to the (intricate) debate see for instance L.M. DE RIJK, "The Authenticity of Aristotle's *Categories*", *Mnemosyne* 4 (2), 1951, pp. 129-159, and I. HUSIK, W.D. ROSS, "The Authenticity of Aristotle's *Categories*", *The Journal of Philosophy* XXXVI (16), 1939, pp. 427-433. Whatever the truth of the matter, the *Categories* have always served the purpose (especially in the Latin Middle Ages) of introducing the reader into the Aristotelian *corpus*, and as such it seems appropriate to start the discussion of Aristotle's notion of 'continuity' from here. An important commentary which will be frequently referred to in what follows (sometimes to agree with it, but frequently to present a dissenting opinion) is J.L. ACKRILL, Categories *and* De Interpretatione. *Translated with Notes (Clarendon Aristotle Series)*, Oxford, Clarendon Press, 2002, which reproduces the original text published in 1963. The commentary, it goes without saying, presents all the virtues and the many vices of an "analytic" reading of Aristotle, one which, while striving to achieve a clear and complete linguistic analysis of the text, tends to abstract it from its historical and systematic context, even within the Aristotelian *corpus*. A sustained critique of Ackrill's commentary to *Categories* 6, together with some precious further remarks, is D. O'BRIEN, "Aristote et la catégorie de quantité. Divisions de la quantité", *Les Études philosophiques* 1, 1978, pp. 25-40. A fundamental introduction to the *Categories* in modern scholarhip (after the pioneering studies of Trendelenburg, especially in A. TRENDELENBURG, *Geschichte der Kategorienlehre. Zwei Abhandlungen (Historische Beiträge zur Philosophie, Bd. I)*, Berlin, Verlag von G. Bethge, 1846) remains H. BONITZ, "Über die Kategorien des Aristoteles", *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften, Philosophisch-historische Klasse*, 10. Band, 5. Heft, 1853, pp. 591-645, recently republished in Italian translation as H. BONITZ, *Sulle categorie di Aristotele*, G. REALE (ed.), V. CICERO (trans.), Milano, Vita e Pensiero, 1995, and also F. BRENTANO, *Von der mannigfachen Bedeutung des Seienfend nach Aristoteles*, Freiburg im Breisgau, Herder'sche Verlagshandlung, 1862, esp. pp. 72-220. Specific – and recent – studies concerning (entirely or partially) Aristotle's discussion of the category of quantity are, first and foremost, those by Peter Studtmann, who tries to reconcile the categorial scheme with Aristotle's hylomorphism and who considers the category of quantity as fundamental in achieving this theoretical goal. See especially: P. STUDTMANN, *Aristotle's Categorial Scheme*, in C. SHIELDS (ed.), *The Oxford Handbook of Aristotle*, Oxford-New York, NY, Oxford University Press, 2012, pp. 63-80, which presents, in an abridged version, the thesis already discussed in ID., *The Foundations of Aristotle's Categorial Scheme*, Milwaukee, WI, Marquette University Press, 2008, and in ID., "Aristotle's Category of Quantity: A Unified Interpretation", *Apeiron* 37, 2004, pp. 69-91. Other important recent studies are P. GREGORIC, "Quantities and Contraries: Aristotle's *Categories* 6, 5b11-6a18", *Apeiron* 39, 2006, pp. 341-358 (which, however, is mostly concerned with the problem of whether quantities can be meaningfully said to have a contrary, a problem which I do not discuss in the thesis) and J. BARNES, *Aristotelian Quantities*, in M. BONELLI, G. MASI (eds.), *Studi sulle* Categorie *di Aristotele*, Amsterdam, Adolf M. Hakkert, 2011, pp. 337-370 (which discusses at length Aristotle's treatment of quantity not only in the *Categories* but also in *Metaphy*sics Δ and which is particularly important for recognising the "elusive" character of Aristotle's whole analysis of quantity, in respect to that of quality, and the reasons thereof; the whole volume, it should also be noted, is an important updated series of studies on the *Categories*, and, at least in another case, dealing specifically with issues raised by Chapter 6: cf. E. CATTANEI, *Aristotele*, Categorie, *6*, *4b20-5b10. Le quantità in senso proprio*, *ibid*., pp. 135-155). Important contributions are also represented by the Introduction to ARISTOTE, *Catégories. Sur l'interprétation (GF 1082)*, P. PELLEGRIN, C. DALIMIER, M. CRUBELLIER (eds., trans.), Paris, Flammarion, 2007. It is remarkable and surprising how little attention contemporary Aristotelian scholarship devotes to this issue.

[33] An important *caveat* is in order here: in what follows I will propose (as in subsequent chapters of the thesis) a connected reading of different Aristotelian passages, either from the same work and from different works. This method might appear dangerous to the historian of ancient philosophy, who could point out that in this way one is forced to disregard issues of chronology and of theoretical "developments" in Aristotle's views. This objection, of course, does not hold today the same strength that it had at the time of

'quantity', Aristotle starts by claiming that "[o]f quantities some are discrete, others continuous" (4b20)[34]. Going further in the discussion, Aristotle notices that "[d]iscrete are number and word[35]; continuous are lines, surfaces, bodies[36], and also, besides these, time and place" (4b22-25)[37]. Two clarifications on this passage are in order. The first

W. JAEGER, *Aristoteles. Grundlegung einer Geschichte seiner Entwicklung*, Berlin, Weidmannsche Buchhandlung, 1923: contemporary scholarship in ancient philosophy has emancipated itself from the rigidity of Jaeger's "developmental" scheme. However, it is true that many examples of attempts to explain away apparent inconsistencies in the Aristotelian *corpus* by referring to the different phases of composition of different works are not altogether absent from contemporary literature and, more in general, there is a widespread consensus towards using the utmost care when providing connected readings of Aristotelian texts. Now, I am fully convinced that, in the case discussed in this chapter (i.e., that of continuity) and, more in general, in all the cases referred to in the thesis, it is quite easy to realise the fundamental consistency of Aristotle's views throughout various works, to a sufficient extent, in any case, aso s to allow such a connected reading. Even if this were not the case, still such a reading would be justified insofar as this thesis is first and foremost concerned with Medieval Latin commentaries on Aristotle, and it is a fact that Medieval Latin commentators had in common the firm conviction that the Aristotelian *corpus* provided a consistent doctrine and that apparent inconsistencies or contradictions between passages could and should be explained away with the help of careful exegesis.

[34] ARISTOTELES, *Categoriae*, ed. L. MINIO-PALUELLO, *Aristotelis* Categoriae *et* liber de interpretatione *(Oxford Classical Texts)*, Oxford, Clarendon Press, 1949: "Τοῦ δὲ ποσοῦ τὸ μέν ἐστι διωρισμένον, τὸ δὲ συνεχές [...]". Translatio Boethii (ARISTOTELES LATINUS, *Categoriae vel Praedicamenta. Translatio Boethii, Editio Composita, Translatio Guillermi de Moerbeka, Lemmata e Simplicii commentario decerpta, Pseudo-Augustini Paraphrasis Themistiana (Aristoteles Latinus I.1-5)*, ed. L. MINIO-PALUELLO, Bruges-Paris, Desclée de Brouwer, 1961, p. 13, ll. 20-21): "Quantitatis aliud est continuum, aliud disgregatum atque discretum […]". Translatio Boethii (editio composita seu vulgata) (*ibid.*, p. 54, ll. 17-18): "Quantitatis AUTEM aliud QUIDEM est continuum, aliud * discretum [...]". Translatio Guillelmi (*ibid.*, p. 92, ll. 30-31): "Quanti autem hoc quidem est distinctum, hoc autem continuum [...]". Translatio Guillelmi (abridged lemmata) (*ibid.*, p. 124, lemma 24): "Quanti autem hoc quidem distinctum hoc autem continuum." Paraphrasis Themistiana (sive Categoriae decem) (*ibid.*, p. 149, ll. 22-23): "[…] ipsius autem quanti aliud est cohaerens, aliud separatum."

[35] Here I translate according to the proposal found in O'BRIEN, "Aristote et la catégorie de quantité. Divisions de la quantité", *op. cit.*, p. 29, which insists on the importance of the singular in the Greek text for the two kinds of discrete quantities identified by Aristotle. Indeed, as the unities composing a single number do not join together to form a continuous quantity, so is the case with the syllables of a *single* word, not certainly with that of two different ones. It is to be remarked, however, that all the four Latin translations of the *Categories* used in the Middle Ages, and also the Paraphrasis Themistiana, translate λὸγος in this context either with *sermo* or *oratio*, thus suggesting a different understanding of the text. Since, however, the case of the "discreteness" of words will not be dealt with in the thesis, I do not pursue this issue further.

[36] As O'BRIEN, "Aristote et la catégorie de quantité. Divisions de la quantité", *op. cit.*, p. 27, remarks, here Aristotle's focus is on sensible entities, and, in general, in listing the kinds of continuous quantities, he seems to be *always* taking as his main standpoint that of the sensible world, rather than that of mathematical entities: even the word ἐπιφάνεια, as O'Brien remarks, "désigne surtout, en raison de son étymologie même, la surface visible ou apparente" (*ibidem*). This idea is, it goes without saying, lost in Latin, where *superficies* refers indistinctly to the geometrical entity and to the visible surface of a sensible body.

[37] ARISTOTELES, *Categoriae*, ed. MINIO-PALUELLO: "ἔστι δὲ διωρισμένον μὲν οἷον ἀριθμὸς καὶ λόγος, συνεχὲς δὲ γραμμή, ἐπιφὰνεια, σῶμα, ἔτι δὲ παρὰ ταῦτα χρόνος καὶ τόπος." Translatio Boethii, ed. MINIO-PALUELLO, p. 13, ll. 23-25: "Est autem discreta quantitas ut numerus et oratio, continua vero ut linea, superficies, corpus, praeter haec vero tempus et locus." Translatio Boethii (editio composita seu vulgata), ed. MINIO-PALUELLO, p. 54, ll. 20-21: "Est autem discreta quantitats ut numerus et oratio, CONTINUUM vero * linea, superficies, corpus; AMPLIUS AUTEM praeter haec tempus et locus." Translatio Guillelmi, ed. MINIO-PALUELLO, p. 93, ll. 2-4: "Est autem distinctum quidem velut numerus et sermo, continuum autem velut linea, superficies, corpus, adhuc autem preter hec tempus et locus." Paraphrasis Themistiana (sive Categoriae decem), ed. MINIO-PALUELLO, p. 149, ll. 23-24; p. 150, l. 20): "Cohaerens est gramme,

thing to remark is that this list is not intended by Aristotle as a mere set of examples of discrete and continuous quantities: at 5a38-b10 Aristotle makes plain that only the items included in this list are called 'quantities' strictly (i.e., *per se*: the Greek at 5a38 is κυρίως, while at 5b8 it is κυρίως καὶ καθ᾽αὑτὰ), whereas any other object can be said to "be" a quantity only accidentally (i.e., *per accidens*: the Greek is κατὰ συμβεβηκός)[38]. Moreover, Aristotle talks of the items in the list as "being" quantities, instead of being items of which quantity can be predicated as an accident. This issue is obviously related to the synthetic and introductory role of the *Categories*, which sometimes leads them to oversimplification. It seems useful, in this respect, to adopt Ackrill's notion, then, of the items included in the list as "the (primary) owners of quantitative properties"[39] (for reasons of expediency, however, in what follows I will refer to them as "quantities").

Why is it that numbers[40] and words are discrete and not continuous? Aristotle, hinting at the definition of continuity he will develop in the *Physics* and in the *Metaphysics*, claims that this is so because:

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epiphania, corpus, locus et tempus; [...]. Separata vero sunt numerus et oratio." Interestingly, movement is absent from the list, although its discussion will become central in *Physics* VI.

[38] Here the English translation I adopt (for the text of the *Categories* due to Ackrill) misleading, since Ackrill translates the expression as "derivatively". Although, of course, this serves the purpose of preserving the contrast with "strictly", the expression is so charged theoretically, throughout the Aristotelian *corpus*, that the usual translation cannot be abandoned without serious reasons. It is also to be noted that Aristotle restates the distinction in *Metaphysics* Δ.13, 1020a14-17, (cf. *infra*), where a line is given as an example of a quantity καθ᾽αυτὸ, and a musician of a quantity κατὰ συμβεβηκός. There, however, Aristotle also provides further subdivisions of these two kinds of quantities (cf. *ibid*., 1020a18-19).

[39] Cf. ACKRILL, Categories *and* De Interpretatione, *op. cit*., pp. 91-92. Ackrill usefully notes that this way of proceeding is different from the one that Aristotle follows in Chapter 8, where he distinguishes between 'qualities' and 'qualified' things, and he suggests that part of the reason why he fails to do the same in respect of quantity might be simply due to a linguistic fact, since "[t]here were not numerous abstract nouns corresponding to the various quantitative predicates, as there were in the case of qualitative predicates. Such general terms as 'length', 'area', and 'time' were ambiguous: a line, for example, could be said to be of a certain length, but it could also itself be called a length" (*ibid*., p. 91). An alternative explanation, yet also referring to linguistic facts, is provided by O'BRIEN, "Aristote et la catégorie de quantité. Divisions de la quantité", *op. cit.*, pp. 36-37.

[40] Ackrill insists, in his commentary, on the idea that the only way to make sense of the inclusion of (natural) numbers in the list of primary kinds of quantities (or better, as Ackrill says, of the primary owners of quantitative properties) is to interpret numbers as referring to "numerable aggregates" (ACKRILL, Categories *and* De Interpretatione, *op. cit*., p. 93). Yet, nothing in the text warrants such an interpretation and, what is more, the text even goes explicitly against such an interpretation, since, at 5a23-26, Aristotle clearly states that numbers cannot have position one in respect with another (albeit, of course, they can be ordered in a series). If, however, Aristotle had been referring to numerical aggregates in his discussion of continuous and discrete quantities, there would have been no reason to deny, in the following section, that numbers can have position: indeed, the position of any given aggregate of (bodily) objects can be located with respect to that of another. O'BRIEN, "Aristote et la catégorie de quantité. Divisions de la quantité", *op. cit*., pp. 28-29, also strongly criticises the identification of numbers with numerical aggregates in Ackrill's commentary.

> the parts of a number have no common boundary at which they join together. For example, if five is a part of ten the two fives do not join together at any common boundary but are separate; nor do the three and the seven join together at any common boundary. Nor could you ever in the case of a number find a common boundary of its parts, but they are always separate. Hence number is one of the discrete quantities[41].

The two elements which form Aristotle's mature definition of continuity are already evident in this brief, but telling, passage. Firstly, a 'continuous' quantity is a notion which is understood mereologically, i.e., by referring to the boundaries (intended as – improper – parts) of the entities which are defined as continuous. Secondly, for such entities to be continuous, their boundaries must be together so as to form, somehow, a unity[42]. While the notion of boundary and the ways in which the boundaries of two entities can be in relation to each other will be at the centre of the discussion of continuity in the *Physics*, the *Metaphysics* will delve into the notion of 'unity' which continuity implies.

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[41] ARISTOTELES, *Categoriae* 6, 4b25-31, ed. MINIO-PALUELLO: "τῶν μὲν γὰρ τοῦ αριθμοῦ μορίων ὀυδείς ἐστι κοινὸς ὅρος, πρὸς ὃν συνάπτει τὰ μόρια αὐτοῦ· οἷον τὰ πέντε εἰ ἔστι τῶν δέκα μόριον, πρὸς οὐδένα κοινὸν ὅρον συνάπτει τὰ πέντε καὶ τὰ πέντε, ἀλλὰ διώρισται· καὶ τὰ τρία γε καὶ τὰ ἑπτὰ πρὸς οὐδένα κοινὸν ὅρον συνάπτει· οὐδ᾽ὅλως ἂν ἔχοις ἐπ᾽ἀριθμοῦ λαβεῖν κοινὸν ὅρον τῶν μορίων, ἀλλ᾽ἀεὶ διώρισται· ὥστε ὁ μὲν ἀριθμὸς τῶν διωρισμένων ἐστίν." Translatio Boethii, ed. MINIO-PALUELLO, p. 13, l. 25-p. 14, l. 4: "Partium enim numeri nullus est communis terminus ad quem partes ipsius coniungantur; ut quinarius, si est pars denarii, ad nullum communem terminum coniunguntur quinque et quinque, sed disiuncti sunt; et tres et septem ad nullum communem terminum coniunguntur; neque omnino aliquis habebit in numero sumere communem terminum partium, sed semper discretae sunt; quare numerus discretorum est." Translatio Boethii (editio composita seu vulgata), ed. MINIO-PALUELLO, p. 54, l. 22-p. 55, l. 4: "Partium ETENIM numeri nullus est communis terminus ad quem COPULES PARTICULAS EIUS; ut QUINQUE ET QUINQUE, si est AD DECEM PARTICULA, ad nullum communem terminum COPULAT quinque et quinque, sed SEMPER DISCRETA sunt; SED et TRIA et septem ad nullum communem terminum * PARTICULARUM, sed semper DISCRETA ET SEPARATA sunt; QUAPROPTER numerus QUIDEM discretorum est." Translatio Guillelmi, ed. MINIO-PALUELLO, p. 93, ll. 4-11: "Partium quidem enim numeri nullus est communis terminus, ad quem copulentur partes ipsius; velut quinque si sunt pars decem, ad nullum communem terminum copulantur quinque et quinque, sed distincta sunt; et tria et septem ad nullum communem terminum copulantur; neque universaliter utique habebis in numero accipere communem terminum partium, sed semper distinctus est; quare numerus quidem distinctorum est." Paraphrasis Themistiana (sive Categoriae decem), ed. MINIO-PALUELLO, p. 150, ll. 20-22: "Quis enim non advertat propriis terminis unum separatum esse a duobus, duos a tribus?"

[42] In this respect, Ackrill claims that Aristotle "overlooks the possibility of looking at the same objects in different ways: the fingers of a hand join together to make one hand, but they remain five fingers" (ACKRILL, Categories *and* De Interpretatione, *op. cit.*, p. 93). This, as will become evident below, is nevertheless a serious interpretative mistake. Indeed, the notion of 'joining together' that Aristotle adopts here will be clarified by the discussion of the *Physics*, where Aristotle will state that a necessary condition for two entities 'joining together' is the fact that their boundaries touch one another, something which does not happen in the case of the fingers of a hand. In fact, surprisingly, Ackrill claims, a few lines before, that Aristotle here "is not talking of touching but of joining together". The Aristotelian passage is, however, fully compatible with touching being a necessary condition of joining together, as the *Physics* states.

When having to discuss the items belonging to the list of continuous quantities, indeed, Aristotle remarks the following:

> [a] line, on the other hand, is a continuous quantity. For it is possible to find a common boundary at which its parts join together, a point[43]. And for a surface, a line; for the parts of a plane join together at some common boundary. Similarly in the case of a body one could find a common boundary – a line or a surface – at which the parts of the body join together. Time also and place are of this kind. For present time joins on to both past time and future time. Place, again, is one of the continuous quantities. For the parts of a body occupy some place, and they join together at the same boundary at which the parts of the body do. Thus place also is a continuous quantity, since its parts join together at one common boundary[44].

[43] According to Aristotle's conception of a line, a line is always formed of lines, and not of points, which are always understood by Aristotle as ontologically derivative: a point is always the limit of a line, and it does not have an independent existence. On these aspects, see especially *Physics* IV.1-5, V.1 and the whole of Book VI.

[44] ARISTOTELES, *Categoriae* 6, 5a1-14, ed. MINIO-PALUELLO: "ἡ δὲ γραμμὴ συνεχής ἐστιν· ἔστι γὰρ λαβεῖν κοινὸν ὅρον πρὸς ὃν τὰ μόρια αὐτῆς συνάπτει, στιγμήν· καὶ τῆς ἐπιφανείας γραμμέν, -τὰ γὰρ τοῦ ἐπιπέδου μόρια πρός τινα κοινὸν ὅρον συνάπτει.- ὡσαύτως δὲ καὶ ἐπὶ τοῦ σώματος ἔχοις ἂν λαβεῖν κοινὸν ὅρον, γραμμὴν ἢ ἐπιφάνειαν, πρὸς ἣν τὰ τοῦ σώματος μόρια συνάπτει. ἔστι δὲ καὶ ὁ χρόνος καὶ ὁ τόπος τῶν τοιούτων· ὁ γὰρ νῦν χρόνος συνάπτει πρὸς τε τὸν παρεληλυθότα καὶ τὸν μέλλοντα. πάλιν ὁ τόπος τῶν συνεχῶν ἐστιν· τόπον γὰρ τινα τὰ τοῦ σώματος μόρια κατέχει, ἃ πρός τινα κοινὸν ὅρον συνάπτει· οὐκοῦν καὶ τὰ τοῦ τόπου μόρια, ἃ κατέχει ἕκαστον τῶν τοῦ σώματος μορίων, πρὸς τὸν αὐτὸν ὅρον συνάπτει πρὸς ὃν καὶ τὰ τοῦ σώματος μόρια· ὥστε συνεχὴς ἂν εἴη καὶ ὁ τόπος· πρὸς γὰρ ἕνα κοινὸν ὅρον αὐτοῦ τὰ μόρια συνάπτει." Translatio Boethii, ed. MINIO-PALUELLO, p. 14, ll. 10-24: "Linea vero continua est; namque est sumere communem terminum ad quem partes ipsius coniunguntur, hoc est autem punctum, et superficiei linea (superficiei enim partes ad quendam communem terminum coniunguntur). Similiter autem et in corpore habebit quis sumere communem terminum, vel lineam vel superficiem, ad quem partes corporis coniunguntur. Sunt autem talium et tempus et locus; praesens enim communis est terminus ad quem coniunguntur praeterita vel futura. Rursus locus continuorum est; locum enim quendam partes corporis retinent, quae ad quendam communem terminum coniunguntur; ergo et loci partes, quas tenent singulae partes corporis, ad eundem terminum coniunguntur ad quem et partes corporis iungebantur, quare continuum est et locus; ad unum enim communem terminum eius partes coniunguntur." Translatio Boethii (editio composita seu vulgata), ed. MINIO-PALUELLO, p. 55, ll. 9-21: "Linea vero CONTINUUM est; POTEST ENIM sumere communem terminum ad quem PARTICULAE EIUS COPULENTUR, ID est * punctum, et superficiei linea (PLANI NAMQUE PARTICULAE ad quendam communem terminum COPULANTUR). Similiter autem et in corpore POTERIS sumere communem terminum, * lineam AUT superficiem ALIQUAM QUAE CORPORIS PARTICULAS COPULAT. EST autem talium et tempus et locus; praesens enim TEMPUS COPULATUR ET AD PRAETERITUM ET AD FUTURUM. Rursus locus continuorum est; locum enim quendam CORPORIS PARTICULAE OBTINENT, quae PARTICULAE ad quendam communem terminum COPULANTUR; ergo et loci PARTICULAE, QUAE OBTINENT SINGULAS CORPORIS PARTICULAS, ad eundem terminum COPULANTUR ad quem et CORPORIS PARTICULAE; QUAPROPTER CONTINUUS ERIT et locus; ad unum enim communem terminum SUAS PARTICULAS CONTINUANT." Translatio Guillelmi, ed. MINIO-PALUELLO, p. 93, ll. 17-28: "Linea autem continuum est; est enim accipere communem terminum ad quem partes ipsius copulantur, punctum; et superficiei lineam (plani enim partes ad quendam communem terminum copulantur). Similiter autem et in corpore habebis utique accipere communem terminum, lineam et superficiem, ad quem corporis partes copulantur. Est autem et tempus et locus talium: quod enim nunc tempus copulat ad preteritum et ad futurum. Iterum locus continuorum est; locum enim quendam corporis partes optinent, que ad quendam communem terminum copulantur, ad quem et loci partes; quare continuum utique erit et locus; ad unum enim communem terminum ipsius partes copulantur." Paraphrasis Themistiana (sive Categoriae decem), ed. MINIO-PALUELLO, p. 149, l. 25-p. 150, l. 19: "Simul namque ut grammes medio punctum figens quasi certum mensurae terminum dederis, utrarumque partium quae, divisa gramme, factae sunt, fit terminus ille

As it is clear from the passage, the notion of 'joining together at a common boundary', which Aristotle takes, in the *Categories*, as the definition of continuity, while applying more obviously to sensible bodies, is explicitly thought by Aristotle to extend to geometrical entities (including place, which is here treated as a three-dimensional entity, contrary to how it will be defined in *Physics* IV) and to time[45].

After discussing these distinctions, Aristotle introduces a further way to differentiate between quantities (one already announced at 4b7-8), depending on whether their parts have relative position one with respect to the other or not (5a15-37). It is of course an open question how this distinction relates to that between continuous and discrete quantities, also because the result of the classification of quantities according to the new criterion is almost the same as the one obtained with the previous one, apart from the case of time[46]. The fact, however, that it is presented in a less prominent way in the text, as the second and less developed one, makes one think that the distinction between

communis, ut incertum sit cui parti affixus terminus videatur; adeo sibi pars utraque cohaeret atque coniuncta est. Epiphania quoque, simili de causa, conexa dicitur et cohaerens; denique si quis hanc dividere voluerit, in eius medio grammen ponat necesse est, haec gramme quae epiphaniam dividit cum ex hac duas partes fecerit. Ipsarum duarum partium ipsa gramme terminus incipit esse communis; sic enim sibi conexa est ut non appareat cui terminus videatur infixus. Similiter corpus si quis secare voluerit, dividendi corporis terminus gramme vel epiphania sit necesse est; ipsa enim praecisio quam gramme facit cum epiphania necesse est descendat in corpus; atque ideo incertum est sive gramme sive epiphania cui parti terminum dederint, cum, diviso corpore, in utraque parte epiphaniam necesse sit reperiri. Ideoque corpus cohaerens est in quo faciendarum duarum partium communis est terminus. Temporis quoque similis ratio est cui dividendo, si velimus terminum dare, dicamus 'modo'. 'Modo' autem inter praeteritum et futurum tempus ita confusum est, ut incertum sit quo debeat separari. Locus autem, quoniam corpus quodcumque circumdat et corporis partibus occupatur, ita communi termino partitur quemadmodum partitur et corpus, ac propterea necesse est eum 'cohaerentem' ut cetera nominari."

[45] Ackrill (cf. ACKRILL, Categories *and* De Interpretatione, *op. cit.*, p. 93) remarks that the 'present time' is treated, in the abovementioned passage, as having duration, something which goes against what Aristotle claims in *Physics* IV.11, where the present time is considered a limit between past and future, analogously to a point between two lines. Yet, I do not see why this should be so. At the linguistic level, although being the subject of συνάπτει, the Greek expression of νῦν χρόνος, which is literally the 'now time', and not the 'present time' (as Ackrill remarks *ibidem*), seems to be clearly contrasted to the ones used to refer to the past (τὸν παρεληλυθότα) and to the future (τὸν μέλλοντα), as contrasting an instant with two durations (interestingly, this aspect distinguishes the Latin Medieval translations of the *Categories*: while, indeed, the two Boethian translations, as seen above, oppose *praesens* to *praeteritum* and *futurum*, thus suggesting that all the three items have duration, the two versions by William of Moerbeke (ca. 1215-ca. 1286) contrast a *nunc tempus* with *praeteritum* and *futurum*, thus suggesting, on the contrary, a fundamental difference, in terms of duration, between the former and the two latter items; this is, perhaps even more clearly, explained by the *Paraphrasis Themistiana* which explicitly talks of a *divisio* between *praeteritum* and *futurum* which is identified by the adverb *modo*). At the theoretical level, there is nothing which prevents reading the passage analogously to those concerning points as being the limits of lines, lines of planes, and planes of bodies.

[46] The anomaly is explained by Ackrill (cf. ACKRILL, Categories *and* De Interpretatione, *op. cit.*, *ad loc.*) by the fact that time should be considered a quantity only derivatively, not primarily, as Aristotle claims in the *Metaphysics*. I postpone any discussion of the issue after the analysis of the relevant passages of the *Metaphysics* (cf. *infra* in this section).

discrete and continuous quantities is the fundamental one Aristotle entertains. More precisely, as will become evident in the analysis of *Physics* V.3 and VI.1, the notion of position does play a precise role in defining the necessary (yet not sufficient) conditions of 'being continuous', and it is instrumental to the characterisation of the latter concept. Reading the *Categories* in light of the *Physics*, then, helps explaining why the two criteria for distinguishing quantities appear to be connected but distinct (and in a specific hierarchical relation) at the same time. An analysis of this issue will, therefore, be postponed to the discussion of the relevant passages from the *Physics*[47].

This said, it is now time to turn to the discussion of continuity in the *Metaphysics*, where it undoubtedly plays a significant role. Indeed, this concept is mentioned in various Books and passages dealing with partially different issues[48].

Among them, a central role is certainly to be assigned to Δ.13, which is the chapter explicitly dedicated, in the "glossary"[49] represented by Book Δ, to the discussion of the meanings of 'quantity', and, thus, the natural place to look for the treatment that Aristotle provides of continuity in the *Metaphysics*. In 1020a8-14, first of all, Aristotle notes that 'magnitude' as such is any quantity whatsoever which is (potentially) divisible in continuous parts. This introduces a fundamental distinction within the category of quantity (which, in this context, has just been defined as that which is divisible in

[47] Whereas the latter part of *Categories* 6 (5b11-6a35), which deals specifically with whether quantities can have contraries, whether they admit of degrees, and whether a quantity can be said to be both equal and unequal, will not be considered in this thesis, since it lies plainly outside of its scope.

[48] In the following list, the only passage where the notion of continuity (used as an attribute) appears in the *Metaphysics*, and which I do not mention, is *Metaphysics* Δ.28, 1024a29-31, where Aristotle, distinguishing the meanings of γένος, notes that a first meaning is the one in which it is possible to talk of 'the human γένος', as referring to the continuous line of generations of human beings. Since this notion is completely different from the one I am interested in in this thesis, I omit it in my discussion in this section.

[49] The traditional interpretation of Book Δ as a sort of "glossary" of philosophical terminology largely unrelated to the project of the *Metaphysics* is, according to recent studies, to be refused in favour of a "connectivist" approach which, instead, stresses the fundamental role the Book plays in the general context of the *Metaphysics*. This new (and, I think, much more correct, even in respect of the role of the Book for theoretical issues pertaining to the Aristotelian *corpus* more generally) interpretation is presented especially in the Introduction to ARISTOTE, Métaphyisique, *Livre Delta. Introduction, traduction et commentaire*, R. BODÉÜS, A. STEVENS (trans., comm.), Paris, Vrin, 2014, which is part of a larger project of a new translation and commentary of the whole *Metaphysics*. This commentary, together with the traditional one of ARISTOTLE, *Aristotle's* Metaphysics*: A Revised Text with Introduction and Commentary* (2 vols.), W.D. ROSS (ed., comm.), Oxford, Clarendon Press 1924, will be the point of reference for the discussion conducted in the following pages. It is to be remarked from the outset, however, that Book Δ remains – traditionally and also in contemporary scholarship – a relatively understudied one, something which, in light of the above new interpretation about its role in the *Metaphysics* and also in light of its undeniable theoretical and historical importance (as the following pages will contribute to show) is to be particularly regretted.

immanent parts): Aristotle distinguishes indeed between a quantity which is a 'multiplicity', insofar as it is 'numerable', and a quantity which is 'measurable', i.e., a 'magnitude'[50]:

> We call a quantity[51] that which is divisible into two or more constituent[52] parts of which each is by nature a one and a 'this'. A quantity is a plurality if it is numerable, a magnitude if it is measurable[53]. We call a plurality that which is divisible potentially into non-continuous parts, a magnitude that which is divisible into continuous parts; in magnitude, that which is continuous in one dimension is length, in two breadth, in three depth. Of these, limited plurality is number, limited length is a line, breadth a surface, depth a solid[54].

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[50] This distinction is different from that between 'discrete' and 'continuous' quantities already seen in the *Categories*, although nothing in principle prevents reconciling them in a single conceptual framework. For a provocative and well-argued proposal in this respect (albeit one which presupposes a hylomorphic interpretative framework) see STUDTMANN, "Aristotle's Category of Quantity: A Unified Interpretation", *op. cit.* The need of such a complex framework, however, could be put into doubt. Traditional commentators, in general, tend to see the two distinctions as almost overlapping (apart from the case of time). Ross says that the distinction of *Metaphysics* Δ.13 "answers to that" of the *Categories* (ARISTOTLE, *Aristotle's* Metaphysics*: A Revised Text with Introduction and Commentary*, ROSS (ed., comm.), *op. cit.*, Vol. I, p. 323), without seeing the need of reconciling them with a specific theoretical construction. A recent proposal which positively explains the compatibility of the two accounts is that contained in C. PFEIFFER, *Aristotle's Theory of Bodies (Oxford Aristotle Texts)*, Oxford, Oxford University Press, 2018. I agree with Pfeiffer (cf. Appendix A of his book) that the true difference between the two classifications is one of emphasis, rather than of concepts. In the *Categories* the fundamental distinction between genera within the category of quantity, i.e., that between continuous and discrete ones, is made explicit, while it is taken for granted in the *Metaphysics*.

[51] As in the *Categories*, Aristotle uses ποσόν to refer to the owners of quantitative properties, rather than to quantities proper (although I will keep referring to the latter, consistently with what I did in the case of the *Categories*).

[52] The Greek ἐνυπάρχοντα refers to the parts which belong to, and are located within, a given entity, and thus, derivatively, that constitute it. Both Latin translations perfectly capture the idea by referring to the parts *que insunt* in a given entity.

[53] The passage helps clarifying that, in Aristotle (as it will be in his commentators) a 'magnitude' is any entity which is extended in one, two or three dimensions, so that extension is preliminary to, and essential to the definition of, magnitude. Throughout the chapter I will focus on magnitude, rather than on extension proper, yet, whenever necessary or helpful to the understanding of the texts discussed, I will distinguish the two concepts according to this basic scheme.

[54] ARISTOTELES, *Metaphysica*, Δ.13, 1020a7-14, ed. W. JAEGER, *Aristotelis Metaphysica (Oxford Classical Texts)*, Oxford, Clarendon Press, 1957: "Ποσὸν λέγεται τὸ διαιρετὸν εἰς ἐνυπάρχοντα ὧν [ἑκάτερον ἢ] ἕκαστον ἕν τι καὶ τόδε τι πέφυκεν εἶναι. πλῆθος μὲν οὖν ποσόν τι ἐὰν ἀριθμητὸν ᾖ, μέγεθος δὲ ἂν μετρητὸν ᾖ. λέγεται δὲ πλῆθος μὲν τὸ διαιρετὸν δυνάμει εἰς μὴ συνεχῆ, μέγεθος δὲ τὸ εἰς συνεχῆ· μεγέθους δὲ τὸ μὲν ἐφ' ἓν συνεχὲς μῆκος τὸ δ' ἐπὶ δύο πλάτος τὸ δ' ἐπὶ τρία βάθος. τούτων δὲ πλῆθος μὲν τὸ πεπερασμένον ἀριθμὸς μῆκος δὲ γραμμὴ πλάτος δὲ ἐπιφάνεια βάθος δὲ σῶμα." Translatio media (ARISTOTELES LATINUS, *Metaphysica, lib. I-X, XII-XIV. Translatio Anonyma sive 'Media' (Aristoteles Latinus XXV.2)*, ed. G. VUILLEMIN-DIEM, Leiden, Brill, 1976, p. 101, ll. 19-26): "Quantum dicitur quod est divisibile in eis que insunt, quorum utrumque aut singulum unum quid et hoc aptum natum esse. Pluralitas ergo quantum quid numerale est et mensura mensurabilis est. Dicitur autem pluralitas quidem quod est divisibile potestate in non continua; mensura vero alia in unum continuum longitudine, alia in duo latitudine, alia in tria profunditate. Horum autem pluralitas quidem finita numerus, sed longitudo linea et latitudo superficies et profundum corpus." Translatio Guillelmi (ARISTOTELES LATINUS, *Metaphysica, lib. I-XIV. Recensio et Translatio Guillelmi de Moerbeka (Aristoteles Latinus XXV.3)*, ed. G. VUILLEMIN-DIEM, Leiden-New York, NY-Köln, Brill, 1995, p. 110, ll. 517-526): "Quantum dicitur quod est diuisibile in EA que insunt,

Many aspects could be underlined in this passage, especially when compared with the *Categories*, such as, for instance, the fact that here Aristotle introduces the concept of 'divisibility', which will be central also to the discussion of (continuous) quantities in the *Physics*. However, for the purposes of the thesis, the following considerations are the most important ones. First of all, the passage does not contain any element relevant to the definition of 'continuity', which is rather presupposed as a premiss. Yet, the distinction between 'pluralities' and 'magnitudes' overlaps significantly (albeit not perfectly) with the one between 'discrete' and 'continuous' quantities in *Categories* 6. Indeed, firstly,

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quorum utrumque aut singulum unum ALIQUID et hoc ALIQUID * natum EST esse. MULTITUDO ergo quantum aliquid SI NUMERABILIS FUERIT, MAGNITUDO AUTEM SI mensurabilis FUERIT. Dicitur autem MULTITUDO quidem * diuisibile potestate in non continua, MAGNITUDO AUTEM QUOD IN CONTINUA; MAGNITUDINIS uero QUE QUIDEM AD unum CONTINUA LONGITUDO, QUE AUTEM AD duo LATITUDO, QUE AUTEM AD tria PROFUNDITAS. Horum autem pluralitas quidem finita numerus, sed longitudo linea et latitudo superficies et profundum corpus." Translatio Scoti: "Quantum dicitur, quod est in ea quae insunt diuisibile, quorum utrunque aut singulum unum quid, et quod quid aptum est esse. Multitudo igitur quantum quod, si numerabilis est: magnitudo vero, si mensurabilis. |f. 124vG| Dicitur autem multitudo quidem, quae potentia diuisibilis est in non continua: magnitudo vero, quae in continua. Magnitudinis autem, quae quidem ad unum continua est, longitudo: quae vero ad duo, latitudo: quae autem ad tria profunditas est. Horum autem multitudo quidem finita numerus, longitudo vero linea, latitudo autem superficies, profunditas vero corpus est" (AVERROES CORDUBENSIS, *Aristotelis Metaphiysicorum libri XIIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metpahysicorum liber (editio Juntina II, vol. VIII)*, Venetiis, apud Junctas, 1562, f. 124rF-124vG; a scientific, albeit not really critical, edition of this portion of the text and of Averroes' commentary is R. PONZALLI, *Averrois in librum V (Δ) Metaphysicorum Aristotelis Commentarius. Edizione condotta su manoscritti scelti con introduzione, note ed uno studio storico-filosofico*, Bern, Francke, 1971). For what concerns the present state of research regarding Latin Medieval translations of the *Metaphysics*, see the very useful M. BORGO, *Latin Medieval Translations of Aristotle's* Metaphysics, in G. GALLUZZO, F. AMERINI (eds.). *A Companion to the Latin Medieval Commentaries on Aristotle's* Metaphysics *(Brill's Companions to the Christian Tradition 43)*, Leiden, Brill, pp. 19-57. Of the four Latin translations of the *Metaphysics* from the Greek edited within the context of the *Aristoteles Latinus*, only the *translatio media* and the *translatio Guillelmi* cover the passages which will be analysed in this chapter, and therefore I refer only to them (the other two, the so-called *translatio Iacobi sive Vetustissima* and the so-called *translatio composita sive Vetus*, cover only the Books A-Γ.4). Of course, to these I have also added the translation from the Arabic which reached the Latin West together with the translation of the *Tafsīr* (the *Long Commentary*) by Averroes, the translation attributed to Michael Scot and realised in the early 13th century (cf. AVERROES CORDUBENSIS, *Aristotelis Metaphysicorum libri XIIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metpahysicorum liber*, Venetiis 1562). Evidently, this last translation is not to be directly compared with the Greek text and with the two translations based on it. Yet, given its important reception in the Latin Middle Ages, it constitutes an important element to be taken into account in analysing the reception of Aristotle's *Metaphysics*. It is, finally, important to bear in mind that many of the (especially partial) translations of the *Metaphysics* circulated in the Latin West since the end of the 12th and the beginning of the 13th century (for instance, for what concerns the evidence regarding one of these translations from the Arabic, see C. MARTINI, *The Arabic Version of the Book Alpha Meizon of Aristotle's* Metaphysics *and the Testimony of the ms. Biblioteca Apostolica Vaticana, Ott. Lat. 2048*, in J. HAMESSE (ed.), *Les traducteurs au travail. Leurs manuscrits et leurs méthodes (Textes et Études du Moyen Âge 18)*, Turnhout, Brepols, 2001, pp. 173-206. This said, the translations presented here give, at the current state of research, the most complete landscape that it is possible to achieve of the Latin translations of the relevant passages from the *Metaphysics* which were in use in the 13th and the 14th century.

'pluralities' are explicitly defined as quantities which are only divisible in non-continuous parts, and, therefore, which are not continuous, whereas 'magnitudes' are those which are divisible in continuous parts and are therefore continuous[55]. Secondly, the items that Aristotle mentions as kinds of pluralities and magnitudes are included in the list of, respectively, discrete and continuous quantities in *Categories* 6. Nevertheless, an important difference can be remarked. In the case of pluralities, indeed, Aristotle only mentions numbers, and not words, whereas, in the case of magnitudes, he only refers to lines, surfaces and solids, which (albeit from the geometrical, and not the sensible, perspective) are almost equivalent with the first three items mentioned in *Categories* 6 as continuous, i.e., line, surface and body, thus excluding place and time which, even in the *Categories*, were separated in the text from the first three items by the expression παρὰ ταῦτα (rendered as *praeter hec* in all the four Medieval Latin translations of the text)[56]. There, however, Aristotle did not justify this apparent hierarchical distinction, something which is done very clearly in the context of *Metaphysics* Δ.13 (in analogy with what happens in *Physics* VI.1-2).

After the passage quoted above, Aristotle goes back to the distinction, already introduced in *Categories* 6, 5a38-b10, between quantities *per se* (καθ᾽αὐτὸ) and quantities *per accidens* (κατὰ συμβεβηκὸς). Among quantities *per se*, Aristotle distinguishes between those that are so 'by essence[57]' (κατ᾽οὐσίαν), such as a line, in which the notion of quantity is a necessary part of the definition, and quantities which are "affections" and "states" (πάθη καὶ ἕξεις) of quantities by essence, such as much and little, long and short, and so on (cf. *ibid*., 1020a17-26)[58]. More relevant for the purposes of the thesis is the classification of quantities *per accidens*. Here Aristotle first identifies a group of entities which can be said to be quantities only equivocally, i.e., insofar as that

[55] This reference to parts, is of course, understandable in two ways, as usefully remarked by PFEIFFER, *Aristotle's Theory of Bodies*, *op. cit.*, pp. 202-203, n. 29 (Appendix A). Either parts are considered continuous one with respect to the (adjacent) one, or each of them is considered continuous in itself. I do not stress this aspect, here, since the topic is addressed more explicitly by Aristotle in *Physics* VI, and I consider it therefore better to analyse it in the context of commenting on *Physics* VI.1-2 (cf. *infra*).

[56] Although it should be noted that the *Paraphrasis Themistiana* does not present this idea, listing all the five kinds of continuous quantities as on a par (cf. *supra* the translation of the relevant passage).

[57] Ross translates "as substances", which certainly represents a suitable alternative. (cf. ARISTOTLE, *Aristotle's* Metaphysics*: A Revised Text with Introduction and Commentary*, ROSS (ed., comm.), *op. cit.*, *ad loc.*).

[58] It is to be remarked that in *Categories* 6, 5b11-29, this last group of terms is said to belong to the category of relations, rather than to that of quantity, so that the only species of *per se* quantities admitted in the *Categories* is that of 'quantities by essence'.

to which they belong, or, better said, in which they inhere, is a quantity. This is especially the case of qualities (but, in principle, also of other kinds of accidents) which can be said to be quantities only insofar as the material substance in which they inhere, as a body, is said to be a quantity. Aristotle mentions the examples of the quality of 'white' and of that of 'musician'. After this first group, Aristotle identifies a second group of quantities *per accidens*, whose paradigmatical examples are motion (which was significantly absent from the discussion in *Categories* 6) and time. In this latter case, it is possible to say that the items belonging to the group, while not being quantities *per se*, are not said to be quantities (and, more in particular, *continuous* quantities) in a completely equivocal manner, rather in a "derivative" way. The passage, for its relevance, needs to be quoted in full:

> Of things that are quantities accidentally, some are so called in the sense in which it was said that musical and white were quantities, viz. because that to which they belong is a quantity, and some are quantities in the way in which motion and time are so; for these are called quantities and continuous because the things of which these are attributes are divisible. I mean not that which is moved, but the space through which it is moved; for because that is a quantity motion also is a quantity, and because this is a quantity time is so[59].

Here the first important element to notice, in respect to the analysis of the cases of motion and time, is the fact that they are explicitly classified not merely as quantities but as

[59] ARISTOTELES, *Metaphysica* Δ.13, 1020a26-32, ed. JAEGER: "τῶν δὲ κατὰ συμβεβηκὸς λεγομένων ποσῶν τὰ μὲν οὕτως λέγεται ὥσπερ ἐλέχθη ὅτι τὸ μουσικὸν ποσὸν καὶ τὸ λευκὸν τῷ εἶναι ποσόν τι ᾧ ὑπάρχουσι, τὰ δὲ ὡς κίνησις καὶ χρόνος• καὶ γὰρ ταῦτα πόσ᾽ ἄττα λέγεται καὶ συνεχῆ τῷ ἐκεῖνα διαιρετὰ εἶναι ὧν ἐστὶ ταῦτα πάθη. λέγω δὲ οὐ τὸ κινούμενον ἀλλ᾽ ὃ ἐκινήθη• τῷ γὰρ ποσὸν εἶναι ἐκεῖνο καὶ ἡ κίνησις ποσή, ὁ δὲ χρόνος τῷ ταύτην." Translatio media, ed. VUILLEMIN-DIEM, p. 102, ll. 8-15: "Secundum accidens vero dictarum quantitatum alie sic dicuntur, sicut dictum est, quia musicum quantum est et album per esse quantum quid, cui insunt, alia ut motus et tempus; et enim hec quanta quedam dicuntur et continue, quia illa sunt divisibiles quorum sunt hee passiones. Dico autem non motum sed quo motum est; nam per esse quantum illud et motus est quantus, tempus vero per esse ipsum." Translatio Guillelmi, ed. VUILLEMIN-DIEM, p. 111, ll. 537-544: "Secundum accidens uero DICTORUM QUANTORUM HOC QUIDEM sic DICITUR sicut dictum est quia musicum quantum * et album per esse quantum quid cui insunt, HEC AUTEM ut motus et tempus; et enim hec quanta quedam dicuntur et CONTINUA EO QUOD illa \DIUISIBILIA SINT\ quorum sunt HEC passiones. Dico autem non QUOD MOUETUR sed QUOD motum est; nam per esse quantum illud et motus est quantus, tempus uero per * ipsum." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Metaphysicorum libri XIIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metpahysicorum liber*, Venetiis 1562, f. 124vI-K): "Eorum autem quae secundum accidens dicuntur quanta, quoddam ita dicitur, ut praedictum est, quia musicum et album quantum est eo quod illud, cui insunt, quantum quid est. Quaedam, ut motus et tempus, et haec nam quanta quaedam et continua dicuntur eo quod illa divisibilia sunt quorum haec sunt passions. Dico autem non quod movetur, sed quo motum est. Etenim quoniam illud quantum est, et motio est quanta, tempus autem propter illam."

continuous quantities (albeit *per accidens*)[60]. However, when it comes to justifying their continuity, Aristotle establishes a precise hierarchy, one which will form the basis of the discussion of continuity in *Physics* VI. Indeed, Aristotle claims that the continuity of motion is founded on the continuity of the (linear) extension of the "space through which it [i.e., the object in motion] is moved", whereas the continuity of time is founded on that of motion. It is important to remark that, as already mentioned, the entity which founds the continuity of both motion and time is not the magnitude of a body (and, more specifically, a moving body)[61]: rather, it is the space through which motion takes place. This aspect will be further elucidated by the analysis of the relevant passages of *Physics* VI.

Apart from the important elements just mentioned, *Metaphysics* Δ.13 has nothing more to say about the understanding of 'continuity'. Some hints in this respect can be

[60] Some commentators, such as, recently, Zanatta (cf., ARISTOTELE, Fisica *di Aristotele (Classici della filosofia)*, M. ZANATTA (ed.), Torino, UTET, 1999), think that this constitutes an apparent contradiction, in the case of time, with the text of *Categories* 6, where, as seen, time is explicitly considered a *per se* quantity. Zanatta solves the apparent contradiction by resorting to an opposition between two different ways to consider time (time in itself, in the *Categories*, and time as the measure of movement in the *Metaphysics*). Although this is not an issue that needs to be solved here, I do not think that Zanatta's solution is correct: indeed, Aristotle's definition of time is always dependent on that of movement, such as in *Physics* IV.11, 219b1-2, where time is defined as a number of movement according to before and after (a definition which poses the separate problem of how to reconcile time, as a continuous quantity, and number as a discrete one - a problem Aristotle solves with a distinction between two kinds of number in *Physics* IV.10, 219b5-9; cf. also IV.12, 220b8-9, and, at least, the recent U. COOPE, *Time for Aristotle*, Oxford, Oxford University Press, 2005, and the classical studies by J. ANNAS, "Aristotle, Number and Time", *The Philosophical Quarterly* 25 (99), 1975, pp. 97-113, and P. CONEN, *Die Zeittheorie des Aristoteles*, München, C.H. Beck, 1964, esp. pp. 138-142) and therefore the notion of a time "in itself" considered independently from movement in the *Categories* appears to be untenable. My proposal is, instead, that, as noted above, the distinction between (place and) time and the other kinds of continuous quantities mentioned in the *Categories* is already present in the passage in which they are introduced, where (place and) time are mentioned after line, surface and body and are introduced by a παρὰ ταῦτα (*praeter haec*). There Aristotle would therefore be talking of (place and) time as a kind of *per se* quantities which is derivative with respect to line, surface and body, yet not a *per accidens* quantity in the way white is. Although, of course, this explanation does not definitively reconcile the two passages, I think that it reduces significantly the theoretical distance between them: Aristotle never considers (place and) time as "primary" *per se* quantities, rather, in the *Categories*, for reasons of expediency, he lists them with the "primary" *per se* quantities of line, surface and body, whereas in the *Metaphysics*, he insists on the distinction from them by including time (and movement) under the kinds of *per accidens* qualities, while keeping them separate from the completely equivocal *per accidens* quantities such as white.

[61] This aspect is variously captured by the two Medieval Greek-Latin translations of *Metaphysics* Δ and by the Arabic-Latin translation discussed. The *translatio media*, as seen, distinguishes between *motum* ('what is moved') and *quo motum est* ('that through which it is moved'), and the *translatio Scoti*, similarly, distinguishes between *quod movetur* ('that which is moved') and *quo motum est* ('that through which it is moved'). Instead, and, perhaps, more problematically, William of Moerbeke opposes *quod mouetur* ('that which is moved') to *quod motum est* ('that [where] movement happens').

found, instead, in another chapter of the same Book, namely Δ.6, and by some remarks in other Books of the *Metaphysics*, especially I and K (and, albeit marginally, M).

Δ.6 is the chapter which is dedicated to the various meanings of 'one'. It is interesting (and, indeed, very relevant) that Aristotle, in this context, as in many others in the *Metaphysics*, links the notion of 'continuity' to that of unity[62]. Indeed, "unity by continuity" is the first (and the "less unitary") of the kinds of *per se* unities that Aristotle identifies[63]:

> Of things that are called one in virtue of their own nature some are so called because they are continuous, e.g. a bundle is made one by a band, and pieces of wood are made one by glue; and a line, even if it is bent, is called one if it is continuous, as each part of the body is, e.g. the leg or the arm. Of these themselves, the continuous by nature are more one than the continuous by art. A thing is called continuous which has by its own nature one movement and cannot have any other; and the movement is one when it is indivisible, and indivisible in time. Those things are continuous by their own nature which are one not merely by contact; for if you put pieces of wood touching one another, you will not say these are one piece of wood or one body or one continuum of any other sort. Things, then, that are continuous in any way are called one, even if they admit of being bent, and still more those which cannot be bent, e.g. the shing or the thigh is more one than the leg, because the movement of the leg needs not be one. And the straight line is more one than the bent; but that which is bent and has an angle we call both one and not one, because its movement may be either simultaneous or not simultaneous; but that of the straight line is always simultaneous, and no part of it which has magnitude rests while another moves, as in the bent line (Δ.6, 1015b36-1016a17)[64].

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[62] Basing himself on this chapter, and also on *Physics* V.3, PFEIFFER, *Aristotle's Theory of Bodies*, *op. cit.*, has argued that continuity is ultimately founded on the presence of a single substantial form which makes two initially distinct entities a single one, with the consequence that the process of coming to sharing their extremities, for the two entities involved, is to be understood as (part of) a process of substantial change. I do believe that Pfeiffer's remark captures something important about the discussion of continuity and unity in the *Metaphysics*. Nevertheless, in what follows I will show why, in my view, this does not suffice to connote the account of continuity in a material substance (as an already "formed" continuous entity), at least as the notion of continuity is defined and discussed in the *Physics* (cf. *infra*). It is this latter understanding that is central to the present thesis, since it is the one that explicitly grounds the reflection on *minima* in Late Ancient and Medieval Aristotelian commentators, as the next chapters will show.

[63] The following ones are "unity by species", "unity by genus", and "unity by speech (or universal)" (cf. *Metaphysics* Δ.6, 1016a17-b6).

[64] ARISTOTELES, *Metaphysica* Δ.6, 1015b36-1016a17, ed. JAEGER: "[…] τῶν δὲ καθ᾽αὐτὰ ἓν λεγομένων τὰ μὲν λέγεται τῷ συνεχῆ εἶναι, οἷον φάκελος δεσμῷ καὶ ξύλα κόλλῃ• καὶ γραμμή, κἂν κεκαμμένη ᾖ, συνεχής δέ, μία λέγεται, ὥσπερ καὶ τῶν μερῶν ἕκαστον, οἷον σκέλος καὶ βραχίων. αὐτῶν δὲ τούτων μᾶλλον ἓν τὰ φύσει συνεχῆ ἢ τεχνη. συνεκὲς δὲ λέγεται οὗ <ἡ> κίνησις μία καθ᾽αὐτὸ καὶ μὴ οἷόν τε ἄλλως· μία δ᾽οὗ ἀδιαίρετος, αδιαίρετος δὲ κατὰ χρόνον. καθ᾽αὑτὰ δὲ συνεχῆ ὅσα μὴ ἁφῇ ἕν· εἰ γὰρ θείης ἁπτόμενα ἀλλήλων ξύλα, οὐ φήσεις ταῦτα εἶναι ἓν οὔτε ξύλον οὔτε σῶμα οὔτ᾽ἄλλο συνεχὲς οὐδέν. τά τε δὴ ὅλως συνεχῆ ἓν λέγεται κἂν ἔχῃ κάμψιν, καὶ ἔτι μᾶλλον τὰ μὴ ἔχοντα κάμψιν, οἷον κνήμη ἢ μηρὸς σκέλους, ὅτι ἐνδέχεται μὴ μίαν εἶναι τὴν κίνησιν τοῦ σκέλους. καὶ ἡ εὐθεῖα τῆς κεκαμμένες μᾶλλον ἕν· τὴν δὲ κεκαμμένην καὶ ἔχουσαν γωνίαν καὶ μίαν καὶ οὐ μίαν λέγομεν, ὅτι ἐνδέχεται καὶ μὴ ἅμα τὴν κίνησιν αὐτῆς εἶναι καὶ ἅμα· τῆς δ᾽εὐθείας ἀεὶ ἅμα, καὶ οὐδὲν μόριον ἔχον μέγεθος τὸ μὲν ἠρεμεῖ τὸ δὲ κινεῖται, ὥσπερ τῆς κεκαμμένης." Translatio media, ed. VUILLEMIN-DIEM, p. 91, ll. 10-27: "[…] secundum se vero unum dictorum alia

The passage introduces two important elements in the Aristotelian conception of the notion of continuity. The first is the definition of continuity as that "which has by its own nature one movement and cannot have any other; and the movement is one when it is indivisible, and indivisible in time". Now, the idea of founding the definition of continuity on that of movement is an element of originality of this passage, one which sets it apart both with respect to the passages already analysed, and of those, in the *Metaphysics* (apart from I.1) and, especially, in the *Physics*, where the definition of continuity will be developed and specified by Aristotle[65]. Nevertheless, it seems important to underline that

dicuntur continuitatis essentia, ut honus cum ligatione et ligna cum visco; et linea, quamquam indirecta sit, quia continua, una dicitur, sicut et partium singule, tibia et brachium. Horum autem magis unum sunt natura continua quam arte. Continuum vero dicitur cuius motus est unus secundum se et non possibile aliter; sed unus unius indivisibilis, et indivisibilis secundum tempus. Secundum se autem continua quecumque non tactu sunt unum; nam si ponis se tangentia ligna, non dices ea unum esse nec lignum nec corpus nec aliud continuum. Que vero omnino sunt continua unum dicuntur quamvis curvitatem habeant, amplius magis que non habent curvitatem, ut tibia aut femur, quia contingit non unum esse motum totius. Et recta magis quam curva unum; curvam vero et angulum habentem unam et non unam dicimus, quia contingit et non simul esse motum eius et simul; recte vero semper simul, nec particula mensuram habens hec quidem quiescit illa vero movetur, quemadmodum curve." Translatio Guillelmi, ed. VUILLEMIN-DIEM, p. 99, l. 205-p. 100, l. 223: "Secundum se uero unum dictorum alia dicuntur EO QUOD CONTINUA SINT, ut honus * UINCULO et ligna cum uisco; et linea, ET SI FLEXA sit, continua AUTEM, una dicitur, sicut et partium singule, tibia et brachium. \IPSORUM autem horum\ magis unum * natura continua quam arte. Continuum uero dicitur cuius motus * unus secundum se et non possibile aliter; unus AUTEM CUIUS indiuisibilis, indiuisibilis AUTEM secundum tempus. Secundum se autem continua quecumque non tactu sunt unum; nam si ponis se tangentia ligna, non dices HEC unum esse nec lignum nec corpus nec aliud continuum NULLUM. Que ITAQUE omnino sunt continua unum dicuntur quamuis REFLEXIONEM habeant, ET ADHUC magis que non habent REFLEXIONEM, ut tibia aut CRUS QUAM SKELOS, quia contingit non unum esse motum SKELI. Et recta \quam FLEXA magis\ unum. REFLEXAM uero et angulum habentem unam et non unam dicimus, quia contingit et non simul esse motum eius et simul. Recte uero semper simul, ET NULLA PARS \habens MAGNITUDINEM\ hec quidem quiescit illa uero mouetur, quemadmodum REFLEXE." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Metaphysicorum libri XIIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metpahysicorum liber*, Venetiis 1562, f. 110vL-111rA): "Illorum vero, quae per se unum dicuntur, haec quidem dicuntur eo quod continua sunt, ut fascis vinculo, et ligna visco. Linea quoque etiam, si curua sit, sed continua, una dicitur, sicuti partium etiam unaquaeque, crus, et brachium. Ex his autem ipsis illa magis unum sunt, quae natura, quam arte continua sunt. Continuum vero dicitur, cuius unus per se motus, et non potest aliter esse. Unus vero, qui indiuisibilis, indiuisibilis autem secundum tempus. Secundum se autem continua, quaecunque non tactu unum sunt. Si enim pones inuicem tangentia ligna, non dices ea unum, neque lignum, neque corpus, nec aliquid continuum esse. Igitur et illa, quaecunque omnino continua sunt, unum dicuntur, etiam si habeant flexionem. Et adhuc magis quae non habent <flexionem>, ut tibia |f. 111rA| aut femur quam crus, quoniam contingit unum non esse motum cruris. Et recta magis quam curua unum est, curuam vero et angulum habentem et unam et non unam dicimus quoniam contingit et non simul eius motum et simul esse. Rectae vero semper simul, nullaque particula magnitudinem habens, haec quidem quiescit, haec vero mouetur, quemadmodum curuae."

[65] Modern commentators, traditionally, following ARISTOTLE, *Aristotle's* Metaphysics*: A Revised Text with Introduction and Commentary*, ROSS (ed., comm.), *op. cit.*, vol. I, p. 302, tend to consider the definition presented here as a less rigorous one meant to include more items than it would have been possible under the alternative definition, that based on the sharing of a common boundary. I do not think, however, that this needs to be the case. Indeed, the idea behind the definition presented here by Aristotle seems to be that

a continuous entity, for Aristotle, is first and foremost a unitary object, so much so that even when it moves, it does so in a unitary way. This aspect will be relevant to the whole analysis of continuity in the Late Ancient and Medieval commentary tradition.

A second point of interest in the passage is constituted by the distinction between 'continuity' and 'touching', a distinction which will play a central role in the definition of continuity in *Physics* V.3 and in *Metaphysics* K.12 (this contributes, incidentally, to stress the global consistency of the analysis of continuity throughout the Aristotelian *corpus*).

A further aspect introduced in the passage, which, instead, will not be pursued in *Physics* V.3 (and VI.1-2) and *Metaphysics* K.12, is the distinction between things which are continuous by nature (such as the trunk of a tree and its branches) and those that are artificially continuous (such as two pieces of wood glued together), where the former is a higher degree of unity by continuity than the latter. This helps showing that Aristotle, apart from applying his notion of continuity both to geometrical and to sensible entities (something which is evident also from this passage), extends it, as for the latter, both to natural and artificially produced substances.

The notion of "unity by continuity", as the lowest kind of *per se* unity, is brought back to the fore by Aristotle at the beginning of Book I (cf. I.1, 1052a15-28)[66]. In this passage Aristotle delves much more deeply into the nature of "unity by continuity" (retaining the same definition of continuity based on simultaneity and indivisibility of movement from Δ.6), and he makes explicit what was already partly implied by his distinction, in Δ.6, between a natural and an artificial "unity by continuity". Here, however, Aristotle introduces an entirely new species of unity, which was absent from

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when a continuous object moves, each of its parts moves at the same time. For instance, when someone moves a leg, or an arm, each of the parts of the leg or the arm respectively is moved at the same time. Contrary to this, in the case of two things in contact, yet not continuous, such as two books piled up one on the other, it is always possible to move one of them (for instance grabbing it) while the other stands still. Now, in light of the above, it seems possible to claim that here Aristotle, instead of defining how two entities can become continuous (i.e., by the sharing of a common boundary), is illustrating a property that they, and only they, necessarily acquire once they have become continuous, and such to constitute a criterion to identify them.

[66] For a recent interpretation of this passage, which usefully situates it in the larger context of Book I, see L.M. CASTELLI (trans., comm.), *Aristotle's* Metaphysics: Book *Iota*, Oxford, Oxford University Press, 2018, and also (concerning more generally the relation between continuity and unity) EAD., *Problems and Paradigms of Unity: Aristotle's Account of the One*, Sankt Augustin, Academia Verlag, 2010.

the discussion in Δ.6, i.e., the unity of a whole (ὅλον) [67]. The idea, as expressed by Aristotle, is that a whole, being what "possesses in itself the cause for itself of its being continuous" (1052a24-25[68]) possesses a higher degree of unity than that of mere "unity by continuity". Aristotle is clearly referring here both to living beings and inanimate entities considered as natural ones, i.e., as having in themselves a principle of motion and change. So, for instance, while a piece of wood would count as having "unity by continuity", but not "unity as a whole", a tree has both "unity by continuity" and "unity as a whole". Yet, the discussion of "unity as a whole", while still relying on the notion of continuity (defined by simultaneity and indivisibility of motion) goes far beyond it, and, as such, it will not be pursued further in this thesis.

[67] The definition(s) of 'whole' (*totum* in all the Latin translations of the *Metaphysics* referred to in this chapter) and its various species are dealt with by Aristotle in *Metaphysics* Δ.26. The basic definition of a 'whole' given there is that a whole is "that which does not lack any part of those from which a whole is said to be constituted by nature" (ARISTOTELES, *Metaphysica* Δ.26, 1023b-26-27, ed. JAEGER: "Ὅλον λέγεται οὗ τε μηθὲν ἄπεστι μέρος ἐξ ὧν λέγεται ὅλον φύσει"). Yet, just after this first statement Aristotle adds that is said to be a whole "what contains the things that are contained <in it>, so that they form a unity" (*ibid*., 1023b27-28: "τὸ περιέχον τὰ περιεχόμενα ὥστε ἕν τι εἶναι ἐκεῖνα"). It is only in this second definition of a whole (or, if preferable, in this second definitory feature of a whole, since the two definitions, far from being mutually exclusive, are complementary) which makes use of the concept of unity and which is, therefore, peculiarly relevant to the discussion of *Metaphysics* I.1. It barely needs being noted that the two definitions of a whole that Aristotle proposes are at risk of circularity, since in the former he makes use of the concept of 'whole' in defining a whole and, in the latter, he makes use of the concept of 'being contained in' while defining a whole as what contains the things being contained in it. It is not surprising that in the further passages which discuss the notion of 'whole' extensively in the *Metaphysics*, such as the discussion of wholes (in general) and unity in I.1, but also the discussion of (composite) wholes and unity in Z.17, 1041b11-33, Aristotle links closely the notion of whole to that of a hylomorphic substance, and, thus, to the role of the substantial form as a principle of unity of the substance. In this sense, a particularly telling passage is *Metaphysics* Δ.6, 1016b12-13, where, speaking of the kind of unity that is instantiated by a whole, Aristotle says that we can say that a thing is a unity if it is a whole, i.e., if it has "the form as [the principle of] unity ("τὸ εἶδος ἔχῃ ἕν"). This, however, adds a further complication to the discussion, insofar as the notion of a whole can only be properly understood in hylomorphic terms, whereas this is not needed for the notion of continuity (at least for the continuity of artificial entities). As Aristotle exemplifies just after the passage quoted: "[…] for instance, we would not say that the parts of a shoe constitute in the same way [as a whole] a unity, seeing that they hold together no matter how, if not due to continuity, but if they hold together so as to constitute a shoe and so to have a certain already unitary form" (*ibid*., 1016b13-16: "οἷον οὐκ ἂν φαῖμεν ὁμοίως ἓν ἰδόντες ὁπωσοῦν τὰ μέρη συνχείμενα τοῦ ὑποδήματος, ἐὰν μὴ διὰ τὴν συνέχειαν, ἀλλ᾽ἐὰν οὕτως ὥστε ὑπόδημα εἶναι καὶ εἶδός τι ἔχειν ἤδη ἕν"). This is the reason why through the chapter (and the thesis) I would generally leave aside Aristotle's notion of whole while discussing continuity, which I take to be an independent and theoretically preliminary notion compared with that of whole, and one which can be discussed outside of a hylomorphic framework.

[68] ARISTOTELES, *Metaphysica*, ed. JAEGER: "[…] ἀλλὰ ἔχει ἐν αὑτῷ τὸ αἴτιον τοῦ συνεχὲς εἶναι." Translatio media, ed. VUILLEMIN-DIEM, p. 184, ll. 11-12: "[…] sed habet in se causam suam ut sit continuum." Translatio Guillelmi, ed. VUILLEMIN-DIEM, p. 195, ll. 11-12: "[…] sed habet in se QUOD EST CAUSA SIBI ut sit continuum." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Metaphysicorum libri XIIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metpahysicorum liber*, Venetiis 1562, f. 249rF): "[…] at habeat in se quod causa ei sit, ut continuum sit."

The only other passage of the *Metaphysics* directly relevant to the notion of 'continuity', apart from K.12, which will be dealt with in the next paragraph (being almost identical to *Physics* V.3, which represents probably the single most important passage in the Aristotelian *corpus* to recover a complete definition of 'continuity'), can be found in Book M[69]. More specifically, in the context of a polemic against Platonists and Pythagoreans concerning the existence of ideal numbers in M.9, Aristotle briefly mentions the idea that (natural) numbers are only in succession (but not in contact and, *a fortiori*, not continuous). The passage is of course relevant, but, since the notion of 'being in succession', and its connection with that of continuity, is only explained in *Metaphysics* K.12 and in *Physics* V.3, I now turn to these texts to provide a fuller account of it. Here it should only be noted that, once again, Aristotle shows an impressive degree of consistency in his discussion of continuity and of connected notions throughout the *corpus*.

1.2.2. The Definition of 'Continuity' in *Physics* V.3 (and *Metaphysics* K.12)

The first (and maybe only[70]) full explicit definition of 'continuity' in Aristotle's natural works (considered in their traditional systematic order) can be found in *Physics*

[69] The authoritative guide to the Book, and also to the passage I mention, remains J. ANNAS, *Aristotle's* Metaphysics, *Books M and N*, Oxford, Clarendon Press, 1976.

[70] If, it might be added, Aristotle does really provide, even in *Physics* V.3, what can be reasonably said to amount to a full-fledged definition of continuity, something which has been challenged in recent scholarship. I do not need to enter in this debate here, insofar as the characterisation of continuity most prominently featuring in *Physics* V.3 has clearly been taken both by Aristotle and by Late Ancient and Medieval commentators as being its standard definition, something which will be made abundantly clear in the rest of this chapter.

V.3[71] and, in a slightly modified version, in *Metaphysics* K.12[72]. *Physics* V.3, which is placed after two chapters devoted to explaining the nature of motion and rest, as well as

[71] An important recent analysis of this chapter is M. PANZA, *"Una stessa cosa". Come intendere la definizione della continuità in Aristotele,* Fisica *V.3, 227a10-12?*, in D. GENERALI (ed.). *Le Radici della razionalità critica: saperi, pratiche, teleologie. Studi offerti a Fabio Minazzi*, Milano, Mimesis, 2015, pp. 715-728. A classical interpretation of the text can be found in T.L. HEATH, *Mathematics in Aristotle*, Oxford, Oxford University Press, 1949. A (further) preliminary remark is in order at this point: in this thesis I will always refer to continuity, in Aristotle and in all the Aristotelian commentators discussed, as a property (eventually defined in relational terms) of material substances (or of mathematical entities abstracted from them). In no way, indeed, albeit there might seem to be some textual evidence to the contrary, does Aristotle (nor did any of his commentators) conceive of the continuum as an object in itself. This, as PANZA, *"Una stessa cosa". Come intendere la definizione della continuità in Aristotele,* Fisica *V.3, 227a10-12?, op. cit.*, remarked, is the standard characterisation of the continuum which is accepted in modern mathematics, i.e., one that considers the continuum as a single entity conceived of in set-theoretical language. This is so at least since the work of Dedekind and Cantor during the second half of the 19th century, but certainly not in Aristotle or in any of his commentators. Having clarified the issue, in what follows I will make reference alternatively to a 'continuous entity' or to a 'continuum' as synonyms, for reasons of expediency.

[72] The authenticity and the relations of *Metaphysics* K with the rest of the *Metaphysics* and of the Aristotelian corpus more generally are the object of a considerable scholarly debate, although the traditional, prevailing opinion is that the Book is inauthentic and fruit of later interpolations in the text of the *Metaphysics* (cf., for the beginning of the debate and the prevailing opinion, P. NATORP, "Ueber Aristoteles' *Metaphysik,* K1-8, 1065a26", *Archiv für Geschichte der Philosophie* 1 (2), 1888, pp. 178-193, and also ID., "Thema und Disposition der aristotelischen Metaphysik", *Philosophische Monatshefte* 24, 1888, pp. 37-65; it should be noted that, apart from any textual consideration, Natorp's main argument for the inauthenticity of the Book is doctrinal, since here, and only here, at K.7, 1064a28-b1, Aristotle identifies first philosophy with theology, i.e., the science of the divine being; a useful interpretation of Natorp's position, together with a summary of the ensuing debate, can be found in L. BRESSAN, "Aristotle's *Metaphysics* Book K in Paul Natorp's Neokantian Perspective", *Lexicon Philosophicum. International Journal for the History of Texts and Ideas* 1, 2013, pp. 153-178; another, though less recent, contribution, which provides additional useful considerations is V. DÉCARIE*, L'authenticité du livre K de la* Métaphysique, in J. WIESNER, P. MORAUX (eds.), *Zweifelhaftes im Corpus Aristotelicum: Studien zu einigen Dubia (Symposium Aristotelicum)*, Berlin-New York, NY, de Gruyter, 1983, pp. 296-317 and also the next chapter of the same collection, but defending the opposite position, P. AUBENQUE, *Sur l'inauthenticité du livre K de la* Métaphysique, *ibid.*, pp. 318-344). The Book presents what can be generally, albeit vaguely, dubbed "paraphrases" of relevant passages from Books B, Γ and E, and, sometimes, also parallel sections with other Aristotelian works, such as in the case discussed here. Yet, the Book cannot be simply considered a mere editorial operation conducted during the period of "systematisation" of the treatises actually composing the *Metaphysics*. Rather, it shows important elements of originality which make it more appropriate to consider it the product of independent Aristotelian lessons on "first philosophy", while, at the same time, its place in the *Metaphysics* is certainly to be ascribed to its role as an appropriate introduction to Book Λ. As such, I consider it an important source for theoretical developments in Aristotle's though, one worth confronting with the relevant texts of the *Physics* discussed below. For a very useful and updated introduction to the current status quaestionis on the authenticity, nature and purpose of the Book, together with a proposal along the lines mentioned above, cf. L. BRESSAN, *Origine e significato del Libro K della* Metafisica *di Aristotele (Memorie Scienze Morali 33)*, Venezia, Istituto Veneto di Scienze Lettere ed Arti, 2019. For an in-depth discussion of the relation between Books Beta and the first two chapters of Book K. which also helps understanding the nature and structure of Book K more generally, cf. A. MADIGAN, SJ, *Aristotle.* Metaphysics *Books B and K 1-2 (Clarendon Aristotle Series)*, Oxford, Clarendon Press, 2002. A separate problem concerns the Latin Medieval reception of Book K. Indeed, none of the Greek-Latin translations of the *Metaphysics* included Book K, which, nevertheless, became known thanks to the Arabic-Latin translation which accompanied Averroes' *Tafsīr*, the *translatio Scoti*. While it is certainly difficult to ascertain the extent to which this Book influenced Latin commentators, the very fact that a translation (and an authoritative one, given the influence exerted by

distinguishing all four kinds of change (226b18), has the explicit purpose of clarifying what is the meaning of some of the main concepts which Aristotle will use in its subsequent discussion concerning motion, in the following chapters of Book V and in Books VI-VIII of the *Physics*. In the opening statement of the chapter, Aristotle lists seven terms which will be dealt with, namely:

1. Together (ἅμα) (*simul*) (*simul*) (*simul*)[73]
2. Apart (χωρίς) (*extra[tim]*)[74] (*separatim*) (*separatim*)
3. Touching (ἁπτόμενον) (*tangere*) (*tangere*) (*tangere*)
4. Between (μεταξύ) (*medium*) (*medium*) (*inter*)
5. In succession (ἐφεξῆς) (*consequenter*) (*consequenter*) (*consequenter*)
6. Contiguous (ἐχόμενον) (*habitum*) (*habitum*) (*contiguum*)
7. Continuous (συνεχές) (*continuum*) (*continuum*) (*continuum*)

Averroes' commentary) was available as early as ca. 1230 makes its consideration worthwhile even for a study of the Medieval Latin reception of the Book.

[73] The Greek term is taken from Ross' 1951 critical edition of the text of the *Physics*, as being the most reliable source of the text itself: cf. ARISTOTELES, *Aristotelis* Physica, ed. W.D. ROSS, Oxford, Clarendon Press, 1951. The first Latin term is taken from the *translatio vetus* of the *Physics*, probably to be attributed to Jacob of Venice (cf. ARISTOTELES, *Physica. Translatio vetus (Aristoteles Latinus VII.1; fasciculus secundus)*, ed. F. BOSSIER, J. BRAMS, Leiden-New York, NY, Brill, 1990). The second Latin term is taken, instead, from the first stage of the revision of the translation by William of Moerbeke, which is still in need of a thorough critical edition (the text is the one of the *Editio Leonina* of Aquinas' *Physics* commentary, originally published in 1884, and produced by correcting the *Editio piana* of 1570 with three manuscripts, only one of which contains the new translation; I quote it from THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. M. MAGGIOLO, Torino-Roma, Marietti, 1965). The second stage of William of Moerbeke's revision of the *translatio vetus*, the so-called *translatio matritensis*, preserved only in ms. Madrid, BN, 1067, has not been consulted. The fragment represented by the *translatio vaticana*, edited as ARISTOTELES, *Physica. Translatio Vaticana (Aristoteles Latinus VII.2)*, ed. A. MANSION, Bruges, Desclée de Brouwer, 1957; reprt. ARISTOTELES, *Physica. Translatio vetus (Aristoteles Latinus VII.1; fasciculus primus)*, praef. F. BOSSIER, J. BRAMS, Leiden-New York, NY, Brill, 1990) probably dating between the end of the 12th and the beginning of the 13th century, since it stops at II.2, does not cover the portions of the text that is the object of the present chapter and can, therefore, be omitted. The third Latin term is, instead, taken from the Arabic-Latin translation that, as in the case of the *Metaphysics*, accompanied Averroes' commentary in the anonymous version attributed to Michael Scot. I quote it from the *editio Juntina II*, vol. IV (cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis (editio Juntina secunda, Vol. IV)*, Venetiis, apud Junctas, 1562).

[74] Some *codices* of the *translatio vetus* also present alternative forms: *ext'atim* (a conflation of *extra* and *separatim*), *extractum*, *extra*, *separatim*, or *separatum*. All the other terms in the list are, instead, always rendered in the same way (cf. ARISTOTELES, *Physica. Translatio vetus*, ed. BOSSIER, BRAMS, p. 200).

Many interpretations have been raised by modern commentators concerning the relation between the items included in the list, and no consensus has been achieved[75]. In what follows, I provide what I think is the most correct interpretation, relying on some modern commentaries, yet combining their insights (and others) in an original way.

Firstly, let us focus on items 1 and 2 on the list. 'Together' and 'apart' are placed at a higher level of generality than the other items included in the list, since they all represent cases of 'being together' or 'being apart'. However, what are the notions of 'being together' and 'being apart' which Aristotle uses here? Aristotle says that "[t]hings are said to be together in place when they are in one primary place and to be apart when they are in different places" (226b21-23)[76]. Now, a reference to the notion of primary place, which has just been defined in Book IV as the "innermost motionless surface of the containing body" (cf. IV.4, 212a20-21)[77], restricts the meaning of 'being together'

[75] Probably the majority of contemporary scholars would agree with what has been suggested in D.J. FURLEY, *The Greek Commentators' Treatment of Aristotle's Theory of the Continuous*, in KRETZMANN (ed.), *Infinity and Continuity in Ancient and Medieval Thought*, *op. cit*., pp. 17-36, esp. pp. 24-25, and in BERRYMAN, *Continuity and Coherence in Early Peripatetic Texts*, *op. cit*., p. 159, namely, that the scale Aristotle proposes in V.3 is from the less unified to the more unified term. While I am convinced that there is a clear progression through the terms analysed in the chapter, I believe that the best way to capture it is by conceiving a process in three successive stages (the first one involving together and apart, as mutually exclusive alternatives, the second one including in contact, between and successive as three terms which can be used to construct two mutually exclusive alternatives, which are then clarified by the introduction of the terms contiguous, and then the third and final one, that represented by the term continuous). The reason for so grouping the terms should become clear in what follows.

[76] ARISTOTELES, *Physica*, ed. ROSS: "ἅμα μὲν οὖν λέγω ταῦτ᾽εἶναι κατὰ τόπον, ὅσα ἐν ἑνὶ τόπῳ ἐστὶ πρώτῳ, χωρὶς δὲ ὅσα ἐν ἑτέρῳ." Translatio vetus, ed. BOSSIER, BRAMS, p. 200, ll. 9-11: "Simul quidem igitur dicuntur hec esse secundum locum, quecumque in uno loco sunt primo, separatim autem quecumque in altero". Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 339): "*Simul* igitur dicuntur haec esse secundum locum, quaecumque in uno loco sunt primo: *separatim* autem, quaecumque sunt in altero". Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem* commentariis, Venetiis 1562, f. 222vM): "Simul igitur dicuntur haec esse secundum locum, quaecunque in uno loco sunt primo. Separatim autem, quaecunque sunt in altero".

[77] ARISTOTELES, *Physica*, ed. ROSS: "ὥστε τὸ τοῦ περιέχοντος πέρας ἀκίνητον πρῶτον, τοῦτ᾽ἔστιν ὁ τόπος"; Translatio vetus, ed. BOSSIER, BRAMS, p. 150, ll. 6-7: "Quare continentis terminus inmobilis primum, hoc est locus." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 224): "Quare terminus continentis immobilis primum, locus est." The definition, it should be noted, is worded in a slightly different way in the Arabic-Latin translation prepared by Michael, Scot, i.e., the *translatio Scoti* (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 133rD): "Censemus igitur locum esse primum quidem, quod continet illud cuius locus est, et nihil ipisius rei esse." Aristotle's doctrine of place, as presented in *Physics* IV.1-5, has traditionally been deemed by scholars as one of the most unsatisfying, and sometimes even incomprehensible, aspects of his natural philosophy (apart from the fact that it explicitly contrasts with the three-dimensional analysis of place as the incorporeal region of space occupied by a body as presented in *Categories* 6, 5a8-14, a topic in which it is not possible to enter here). Nevertheless, this initial appearance of obscurity and underlying inconsistencies might not be the last word on the subject. Although I cannot enter the debate here, see at least the recent proposal for a rehabilitation contained in B. MORISON, *On Location: Aristotle's Concept of Place*, Oxford, Oxford

which is acceptable in this passage. Indeed, contrary to some (also recent) interpretations, according to which, for instance, two boxes in the same room would be 'together' according to Aristotle's definition of *Physics* V.3, two objects can be together if and only if the innermost surface of the body which immediately contains them (considered as a whole) is the same[78].

If this is so, however, an immediate consequence follows, namely, the fact that two objects which are separated in space (albeit being very close one to the other) cannot be said to be 'together' in the sense mentioned above; rather, they will be apart. To put it in other words, two objects can be said to be 'together' in the sense mentioned above if and only if they are in contact (i.e. if they touch each other), so that their surfaces coincide. In this case, properly speaking, only their surfaces (their extremities) are in the same primary place, but, by extension, it is possible to claim that also the two objects as wholes are in the same primary place[79].

These considerations lead naturally to item 3 in the list, 'touching', which Aristotle, as already hinted, defines as follows: two things touch when "their extremities are together" (226b23). The first important thing to notice is that the definition of 'touching' is given, by Aristotle, mereologically: it is now specifically by looking at the

University Press, 2002, which not only provides forceful (though debatable) interpretations of the relevant Aristotelian passages, but also tries to connect the debate with relevant issues in contemporary analytic metaphysics. Another proposal which goes in the same direction of rehabilitating Aristotle's doctrine of place is G. ABBATE, *Il luogo in Aristotele. Traduzione e commento di* Fisica *Delta 1-5*, Macerata, EUM – Edizioni Università di Macerata, 2007.

[78] Many modern commentators have remarked that, strictly speaking, the primary place of two (extended) objects can never be the same according to the definition of *Physics* IV.4, since, in the limit case, the surface of one of the two objects becomes (part of) the place of the other. I think that this line of reasoning is misguided, and not warranted by the Aristotelian text of *Physics* V.3. Aristotle does not talk, indeed, of two objects having the same primary place, rather of two objects 'being together in a primary place'. This is compatible, as I have said above, with the idea that the definition holds whenever the two objects considered (or, better said, their surfaces) coincide and can therefore be delimited by the same innermost surface, which is, arguably, what Ross means when he talks, in his commentary, of how two objects can be together yet numerically distinct.

[79] I go explicitly against Pfeiffer's argument here that, in the case of two objects touching, only their extremities are in the same primary place. Now, Aristotle admittedly talks, in *Physics* IV.5, of the (quantitative) parts of objects being in a place which is represented by the whole that contains them. Yet, Aristotle explicitly admits, while discussing item 1 on the list, that two objects (and not their parts) can be in the same primary place. If this is possible, then, whenever the extremities of two objects come to touch, the objects as wholes are in the same primary place, as Ross implies in his discussion of two objects being together yet numerically distinct. The difference is just in the point of view one chooses to take: there is no need for instituting an opposition between them, as Pfeiffer does in Proposition 27 of his book (cf. PFEIFFER, *Aristotle's Theory of Bodies*, *op. cit.*, Section 7.2.1.2 and Appendix B, p. 213). In whatever way one interprets the claim, anyway, little depends on it, for the purposes of this chapter. On the whole debate see also FURLEY, *The Greek Commentators' Treatment of Aristotle's Theory of the Continuous*, *op. cit.*, esp. pp. 20-27.

extremities of two objects, taken as (improper) parts, that it is possible to determine their respective relation of 'touching'. This observation is important for the topic discussed in this chapter, since, as already seen in the analysis of *Categories* 6, Aristotle's definition of continuity is also a mereological one, which applies specifically to the extremities of two objects. At the same time, however, it should always be kept in mind that two objects can have their extremities together only if they are, as wholes, together.

The case of item 4, betweenness, is more complex, and I cannot deal with all the intricacies of the text here, since this would lead me astray from the main purpose of the chapter. Indeed, Aristotle, surprisingly, instead of considering here the obvious case of an object C which is placed between the two objects A and B, so that, even if they are close to each other, they are not touching, leaves this discussion to item 5 and turns to a completely different problem. The notion of betweenness implied by item 4 in the list is not specifically concerned with spatial relations. Aristotle focuses here on the idea of an intermediate stage in change, rather than that of an intermediate object between other two. Yet, upon further reflection, it is possible to suggest why Aristotle places item 4 at this point of the list. Indeed, albeit the notion applies, according to the text, to all four kinds of change, Aristotle discusses more directly and more at length the idea of an intermediate in the case of local motion. Thus, he comes to claim that the intermediate in linear motion on a line AB is every position on the line which something moving from A towards B reaches before reaching B. When this specific case is considered, the connection with the analysis of spatial relations between objects represented by *Physics* V.3 becomes clear. Aristotle is providing, with his analysis, a rigorous definition of betweenness. According to such definition, in the case of two objects A and B, an object C can be said to be between A and B only if it occupies a position along the straight line which has as its extremities A and B and that would therefore be traversed by something moving from A to B (or from B to A, for that matter).

The successive item on the list depends on Aristotle's definition of betwenness, and it is therefore at a lower level of generality. 'Being consecutive', according to Aristotle, amounts to not having any intermediary of the same kind in-between. Aristotle helpfully distinguishes three different cases. In the case of the two material objects A and B considered above, this means that there is no other material object C between A and B. In the case of two lines, this implies that no further line (or other geometrical entity) is

placed between the two lines considered. In the case of (natural) numbers, this implies that no other (natural) number is placed between two given (natural) numbers, such as 1 and 2. As it is clear (this will be important in the commentators' understanding of this Aristotelian definition), Aristotle does not take the word 'kind' here in the usual, technical sense it has in its writings, but rather merely as distinguishing between geometrical entities, "enmattered" magnitudes and discrete quantities such as (natural) numbers.

After discussing 'being in succession', Aristotle turns to item 6, 'being contiguous'. This is, undoubtedly, the most problematic item included in the list, since, theoretically, one could completely do away with it. Aristotle, indeed, defines 'being contiguous' as the conjunction of items 3 and item 5: whatever is consecutive and, moreover, touches, is contiguous. Yet, as should be clear from the analysis above, it is not possible that two objects, A and B, touch without at the same time being consecutive. This observation raises the obvious question of why Aristotle felt the need to include a "redundant" term in the list which is coextensive with 'touching'[80]. The answer, I think, lies in the intensional content of the word. Indeed, the verb 'ἅπτεσθαι', which Aristotle uses to refer to item 3, as seen, implies the idea of two objects merely *coming* together, as if the verb described the end-state of the reciprocal movement of the two objects one towards the other. On the contrary, the Greek term used by Aristotle to refer to item 6, 'ἐχόμενον', clearly refers to two objects which, in a sense, "are kept together" (as the use of the passive participle of the verb 'ἔχω' suggests)[81]. Here the focus is on two objects, if

[80] Ross, in his 1936 *Physics* commentary (cf. ARISTOTLE, *Aristotle's* Physics. *A Revised Text, with Introduction and Commentary*, W.D. ROSS (ed.), Oxford, Clarendon Press, 1936, *ad loc.*), argues that the text, as it stands, misleadingly presents two different hierarchies of the terms involved, one of which is the prevalent one. Indeed, he notices that Aristotle starts by defining touching and being in succession "independently of each other" at, respectively, 226b23 and 226b34. The idea, naturally flowing from the two definitions, is that two things are contiguous when they possess both attributes, implying that they can possess one without possessing the other. Clearly this does not pose any problem insofar as one claims that something can be in succession without touching. The problem is the reverse, obviously, since there seems to be no way in which, in the Aristotelian classification, something might be contiguous, yet not in succession (Simplicius would later claim that this is possible if one of the two objects involved is not of the same kind than the other – but this adds a further condition on 'being in succession' which is not at all implied by the Aristotelian text). In 227a18 Aristotle, however, clearly says that being in succession is the genus of which touching is a species, thus implying that, by definition, whatever touches is in succession (and, therefore, that 'contiguous' amounts to no more than a mere synonym of 'touching', making the previous definition of 'contiguous' given at 227a6 "misleading" insofar as it seems to imply two attributes which are logically independent from one another, 'being in succession' and 'touching'). Interestingly, in this sense, Aristotle reinforces the ambiguity by describing the 'continuous' indifferently as a species of both the 'contiguous' (227a10) and of the 'touching' (227a21).

[81] I am indebted, for this etymological remark, to SHATALOV, "Continuity and Mathematical Ontology in Aristotle", *op. cit.*, p. 36, where the author also notes that the same extends to συνεχὲς, which is the form

I may say so, which are *stably* in contact, and not which merely come to touch one another while moving. Of course, this is pure speculation, but, I think, it helps uncover the theoretical progression that Aristotle is describing[82].

It is only after this complex set of definitions that Aristotle comes to item 7, continuity proper. The passage is fundamental for the chapter, and I therefore quote it in full:

> The continuous is a subdivision of the contiguous: things are called continuous when the touching limits of each become one and the same and are, as the word implies, contained in each other: continuity is impossible if these extremities are two. This definition makes it plain that continuity belongs to things that naturally in virtue of their mutual contact form a unity. And in whatever way that which holds them together is one, so too will the whole be one, e.g. by a rivet or glue or contact or organic union[83].

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of the active participle of a compound of ἔχω that shows, instead, that there is an internal principle which makes it so that the extremities of the entities involved 'hold themselves together'.

[82] It can be noted, in this respect, that both Greek-Latin translations of the passage maintain (and even reinforce) this contraposition by translating item 3 with *tangere* and item 6 with *habitum*, where the reference to the stability of conjunction between two objects becomes evident.

[83] ARISTOTELES, *Physica*, V.3, 227a10-17, ed. ROSS: "τὸ δὲ συνεχὲς ἔστι μὲν ὅπερ ἐχόμενόν τι, λέγω δ᾽εἶναι συνεχὲς ὅταν ταὐτὸ γένηται καὶ ἓν τὸ ἑκατέρου πέρας οἷς ἅπτονται, καὶ ὥσπερ σημαίνει τοὔνομα, συνέχηται. τοῦτο δ᾽οὐχ οἷόν τε δυοῖν ὄντον εἶναι τοῖν ἐσχάτοιν. Τούτου δὲ διωρισμένου φανερὸν ὅτι ἐν τούτοις ἐστὶ τὸ συνεχές, ἐξ ὧν ἓν τι πέφυκε γίγνεσθαι κατὰ τὴν σύναψιν. Καὶ ὥς ποτε γίγνεται τὸ συνέχον ἕν, οὕτο καὶ τὸ ὅλον ἔσται ἕν, οἷον ἢ γόμφῳ ἢ κόλλῃ ἢ ἁφῇ ἢ προσφύσει." Translatio vetus, ed. BOSSIER, BRAMS, p. 201, l. 14-p. 202, l. 4: "Continuum autem est quidem quod quidem habitum aliquod, dico autem esse continuum cum idem fiat et unus utriusque terminus que tangantur, et sicut significat nomen, contineatur. Hoc autem esse non potest cum duo sint ultima. Sed hoc determinato manifestum est quod in his est continuum, ex quibus unum aliquod aptum natum est fieri secundum contactum. Et sicut aliquando fit continuum unum, sic et totum erit unum, ut aut castratura aut colla aut tactu aut insertu." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 339): "*Continuum* autem est quidem quod habitum aliquid est. Dico autem esse continuum, cum idem fiat et unus utriusque terminus eorum quae tanguntur, et sicut significat nomen, contineatur: hoc autem esse non potest cum duo sint ultima. Sed hoc determinato, manifestum est quod in his est continuum, ex quibus unum aliquod aptum est fieri secundum contactum. Et sicut aliquando fit continuum unum, sic et totum erit unum; ut aut conclavatione aut colla aut tactu aut adnascentia." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem* commentariis, Venetiis 1562, f. 224vI; f. 225rA-B): "Continuum autem est quidem quod contiguum quiddam est. Dico autem esse continuum, cum idem fiat et unus utriusque terminus quibus tangunt et, ut significat nomen, contineantur. Hoc autem esse non potest, si duo sint ultima. |f. 225rA| Hoc autem determinato, manifestum est quod in iis est continuum, ex quibus unum quid aptum natura est fieri secundum contactum. Et ut demum fit continuum unum, sic et totum unum erit, ut aut clauo, aut glutine, aut tactu, aut insertu." It is to be remarked how all the Latin translations preserve the etymological connection established by Aristotle between 'continuous' and 'holding together', linking *continuum* to *contineatur*, and, therefore, stressing the importance of the unity which is achieved by a continuous entity, or, better, by the "becoming continuous" of two different entities. Cf. also the corresponding passage of *Metaphysics* K.12, 1069a5-8, ed. JAEGER: "τὸ δὲ συνεχὲς ὅπερ ἐχόμενόν τι. λέγω δὲ συνεχὲς ὅταν ταὐτὸ γένηται καὶ ἓν τὸ ἑκατέρου πέρας οἷς ἅπτονται καὶ συνέχονται, ὥστε δῆλον ὅτι τὸ συνεχὲς ἐν τούτοις ἐξ ὧν ἕν τι πέφυκε γίγνεσθαι κατὰ τὴν σύναψιν." This passage limits itself to resume and to paraphrase the one from the *Physics*, although it is to be noted that various elements get lost, from the etymological connection between 'continuous' and 'holding together' to the kinds of "junctions" which make two entities

The first fundamental element to note in the passage is that the definition of continuity given here is the same as that given in *Categories* 6: two objects are continuous insofar as their extremities become one. Now, however, the definition is made more understandable thanks to the "axiomatic" derivation introduced by Aristotle in *Physics* V.3. Indeed, continuity is now defined as a species of contiguity (i.e., of *stable* touching) which in itself is a species of succession. The relations of logical entailment holding between the three concepts are explicitly acknowledged by Aristotle in the last part of the chapter[84].

Moreover, the passage also links the definition of continuity from *Categories* 6 with the stress on the connection between continuity and unity evident from the passages of the *Metaphysics* analysed above, especially Δ.6 and I.1. Indeed, here Aristotle retains and further specifies the idea that two continuous objects, by virtue of their sharing their extremities, come to form a single entity[85]. He mentions, again, albeit less directly, the distinction between a unity which is achieved "naturally" (i.e., by 'organic union' or any other kind of natural contact) and one which is achieved "artificially" (i.e., by 'rivet', 'glue', or any other kind of technical process performed on two objects). Yet, Aristotle also seems to imply, by the use of the adverb 'naturally', that there must be some sort of predisposition between the two objects to form a continuous entity, or, in any case, that (as the *Metaphysics* made explicit) there is a precise hierarchy between the continuity

continuous, listed at the end of the passage from *Physics* V.3. As for the Latin translations of this passage, since Book K was not included in either of the two Greek-Latin translation (better, neither in Jacob's original one nor in Moerbeke's revision), the only Latin translation was from the Arabic. The *translatio Scoti*, in particular, reads: "continuum sane, quoddam attiguus aut tangens est. Dicitur vero continuum, cum idem fiunt, atque unus utriusque termini quibus tangunt et se continuant. Quare patet in his esse continuum, ex quibus unum quiddam natum est secundum contactum fieri" (AVERROES CORDUBENSIS, *Aristotelis Metaphysicorum libri XIIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metpahysicorum liber*, Venetiis 1562, f. 285vL). It is noteworthy that in the translation of the passage, as it happens in the Greek text and, presumably, also in the Arabic translation, the etymological connection of *Physics* V.3 is completely lost also in Latin.

[84] Cf. *Physics* V.3, 227a17-32.

[85] This introduces, of course, a fundamental distinction between continuity and all the property previously defined in V.3: while all the latter obtain between two (or three) objects, continuity is always the property of a single entity, albeit it originates from the conjunction of two different objects. PFEIFFER, *Aristotle's Theory of Bodies*, *op. cit.*, is right in underlining this aspect, which, moreover, reduces the tensions between *Physics* V.3 and VI.1, where continuity, as it will be shown below, is assumed as the property of a single entity. Nevertheless, I think that his recourse to the role of form as the "principle" and fundamental cause of unity of a continuous entity is unwarranted by the text.

which is obtained via natural processes and that which is "imposed" upon nature by artificial processes.

At the end of the analysis of *Physics* V.3, what is probably most surprising is not what Aristotle discusses, rather, it is what he does not even mention, namely, the issue of divisibility. It is all the more remarkable, indeed, that the notion of continuity is defined and discussed, here and (apart from an exception noted above) in the *Categories* and in the *Metaphysics*, without even mentioning the concept of divisibility. This is a point that needs to be particularly stressed in the context of this thesis, since the problems that will be dealt with in the next chapters all presuppose the natural premiss that continuity, according to Aristotle, implies (potential) infinite divisibility. As I will show below, indeed, commentators progressively detached themselves from the perspective of *Physics* V.3 to focus on that, centred on the link between continuity and (potential) infinite divisibility, which is most prominent in *Physics* VI.1-2, to which I now turn.

1.2.3. Continuity and (Potential) Infinite Divisibility in *Physics* VI.1-2

In *Physics* VI.1, indeed, Aristotle establishes an explicit link between continuity and (potential) infinite divisibility[86]. Here Aristotle, in the context of introducing a detailed discussion of continuity[87], opens the chapter as follows:

> Now if the terms 'continuous', 'touching'[88], and 'in succession' are understood as defined above – things being continuous if their extremities are one, touching if their extremities are together, and being in succession if there is nothing of their own kind intermediate between them – nothing that is continuous can be composed of indivisibles: e.g. a line cannot be composed of points, the line being continuous and the point indivisible[89].

[86] An authoritative interpretation of the way in which Aristotle considers continuity in *Physics* VI, at least as an unavoidable term of comparison, is D. BOSTOCK, *On Continuity in* Physics *VI*, in ID., *Space, Time, Matter and Form: Essays on Aristotle's* Physics, Oxford, Oxford University Press, 2006, pp. 158-188.

[87] A discussion, it should be remarked from the outset, that presupposes the definition of continuity (supposedly, the one provided in *Physics* V.3), rather than contributing to determining it.

[88] Interestingly, the notion of 'contiguity' disappears completely from the discussion in *Physics* VI, where Aristotle is specifically interested in continuity and therefore, for reasons of expediency, does not need to distinguish between 'touching', 'being in contact' and 'being contiguous' anymore: this supports the idea that touching and being contiguous are used by Aristotle as coextensive terms.

[89] ARISTOTELES, *Physica* VI.1, 231a21-26, ed. ROSS: "Εἰ δ᾽ἐστὶ συνεχὲς καὶ ἁπτόμενον καὶ ἐφεξῆς, ὡς διώρισται πρότερον, συνεχῆ μὲν ὧν τὰ ἔσχατα ἕν, ἁπτόμενα δ᾽ὧν ἅμα, ἐφεξῆς δ᾽ὧν μηδὲν μεταξὺ συγγενές, ἀδύνατον ἐξ ἀδιαιρέτων εἶναί τι συνεχές, οἷον γραμμὴν ἐκ στιγμῶν, εἴπερ ἡ γραμμὴ μὲν συνεχές, ἡ στιγμὴ δὲ ἀδιαίρετον." Translatio vetus, ed. BOSSIER, BRAMS, p. 216, ll. 3-8: "Si autem est continuum et quod tangitur et consequenter, sicut diffinitum est prius, continua quidem quorum ultima unum, que vero

The statement appears at first glance surprising, since, after restating the last three definitions already seen in *Physics* V.3, Aristotle abruptly shifts his focus on the relation between continuity and divisibility, and, more specifically, on the case of the relation between continuity and divisibility in geometrical entities.

The unfolding of the chapter (and also of VI.2), which, as has been remarked by commentators, is at times blurred and, in any case, not entirely perspicuous, shows a series of arguments to support the claim that "nothing that is continuous can be composed of indivisibles" (and that, *a fortiori*, it cannot be divided into them). Aristotle's arguments are basically two. The first one is addressed exclusively at geometrical entities and at (geometrical) indivisibles, i.e., points. The second, instead, is exclusively aimed at "magnitude, motion and time" and, therefore, focuses on extended indivisibles, i.e., "physical" atoms.

The first argument is mereological in nature, and it is presented in two stages (or "sub-arguments"). The first stage is as follows:

> For the extremities of two points can neither be one (since of an indivisible there can be no extremity as distinct from some other part) nor together (since that which has no parts can have no extremity, the extremity and the thing of which it is the extremity being distinct)[90].

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tanguntur quorum simul, consequenter autem quorum nichil est medium proximi generis, inpossibile est ex indivisibilibus esse aliquod continuum, ut lineam ex punctis, si vere linea quidem continuum est, punctum autem indivisibile." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 373): "Si autem est continuum, et quod tangit, et consequenter, sicut definitum est prius (continua quidem quorum ultima unum, quae vero tanguntur quorum simul, consequenter autem quorum nihil est medium sui generis), impossibile est ex indivisibilibus esse aliquid continuum, ut lineam esse ex punctis; si vere linea quidem continuum est, punctum autem indivisibile." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem* commentariis, Venetiis 1562, f. 246vH-I): "Si autem est continuum, et tangens et consequenter, ut definitum est prius (continua quidem, quorum ultima sunt unum; tangentia vero, quorum simul; consequenter autem inter quae nihil est eiusdem generis), impossibile est ex indiuisibilibus esse aliquid continuum, ut lineam esse ex punctis, si linea quidem continuum est, punctum autem indiuisibile."

[90] ARISTOTELES, *Physica* VI.1, 231a26-29, ed. ROSS: "οὔτε γὰρ ἓν τὰ ἔσχατα τῶν στιγμῶν (οὐ γὰρ ἐστι τὸ μὲν ἔσχατον τὸ δ᾽ἄλλο τι μόριον τοῦ ἀδιαιρέτου), οὔθ᾽ἅμα τὰ ἔσχατα (οὐ γάρ ἐστιν ἔσχατον τοῦ ἀμεροῦς οὐδέν· ἕτερον γὰρ τὸ ἔσχατον καὶ οὗ ἔσχατον)." Translatio vetus, ed. BOSSIER, BRAMS, p. 216, ll. 9-12: "Neque enim unum sunt ultima punctorum; non enim est hoc quidem ultimum aliud autem aliqua pars indivisibilis; neque simul ultima; non enim est ultimum nichil inpartibilis; alterum enim est ultimum et cuius est ultimum." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 373): "Neque enim unum sunt ultima punctorum: non est enim hoc quidem ultimum, illud autem aliqua pars indivisibilis. Neque simul sunt ultima: non enim est ultimum ullum impartibilis; alterum enim est ultimum et cuius est ultimum." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem*

This stage can be formalised as follows:

Premiss 1: Everything which is continuous has parts (by the definition of continuity adopted in *Categories* 6 and in *Physics* V.3).
Premiss 2: Yet, a (geometrical) indivisible, by definition, has no parts (otherwise it could be divided into them)[91].
Conclusion: Therefore, no continuous entity is indivisible.

The argument, as reconstructed, is a very simple *modus tollens*, and, it does not only prevent two (geometrical) indivisibles from being continuous, but even from touching, as Aristotle remarks, since not only the definition of continuity, but also that of contiguity (and that of touching, however the two are distinguished) makes use of the notion of parts, so that the very same *modus tollens* presented above can be applied to claim that no (geometrical) indivisible touches or is contiguous with another (geometrical) indivisible. Interestingly, Aristotle also inserts a corollary to this argument, based on a different line of reasoning and concerning a slightly different case. Indeed, he remarks that no (geometrical) indivisible can even be said to be in succession to another (geometrical) indivisible, but this time for a different reason. Indeed, it follows from Aristotle's definition of a point as the limit of a line[92] that between any two points there must necessarily be a line, insofar as a point cannot exist if not as the limit of a line, therefore, if the line of which it is a limit does not exist in act, neither does the point itself. As a result, assuming as an additional premiss that, given a line, it is always possible to divide it at a point, and that, as a result, in any line, however small, there always exists, potentially, a point, it follows that, if between two points there must always be a line, between two points there will always be at least another point. As a consequence, no two

commentariis, Venetiis 1562, f. 246vI): "Neque nam unum sunt ultima punctorum: non nam est hoc quidem ultimum, illud vero alia quaedam pars ipsius indiuisibilis. Neque simul sunt ultima: non nam est ultimum ullum eius, quod impartibile est; alterum nam est ultimum et id cuius est ultimum." It is to be remarked how all the three Latin translations capture the sense of the Greek ἀμερὸς as *inpartibilis*/*impartibilis*, rendering not only the idea that indivisible entities (and, paradigmatically, points) do not have parts, but also, and more specifically, that they cannot be *divided* into parts.
[91] Here it appears clearly that the paradigmatic case of indivisible Aristotle refers in this argument is a point, as a geometrical unextended entity.
[92] On this definition, cf. *infra* the subsection devoted to the discussion of *De generatione* I.2.

points could ever be in succession (consecutive) one to the other, insofar as something of the same kind (i.e., another point) will be between them. Significantly, Aristotle also takes this argument to apply to 'nows' as instants of time, and not merely to points as (geometrical) indivisibles (cf., for the presentation of the argument, both applying to points and to instants of time, 231b7-9).

Yet, the argument up to this point has nothing to say concerning the case of a (geometrical) indivisible being *part* of a continuous entity, albeit not being in itself continuous. Aristotle therefore goes on to present the second stage of his argument, which presupposes the first:

> Moreover, if that which is continuous is composed of points, these points must be either continuous or touching with one another: and the same reasoning applies in the case of all indivisibles. Now for the reason given above they cannot be continuous; and one thing can touch another as whole with whole or part with part or part with whole. But since indivisibles have no parts, they must touch each other as whole with whole. And if they touch each other as whole with whole, they will not be continuous; for that which is continuous has distinct parts, and these parts into which it is divisible are different in this way, i.e. spatially separate[93].

[93] ARISTOTELES, *Physica* VI.1, 231a29-231b6, ed. ROSS: "ἔτι δ᾽ἀναγκη ἤτοι συνεχεῖς εἶναι τὰς στιγμὰς ἢ ἁπτομένας ἀλλήλων, ἐξ ὧν ἐστι τὸ συνεχές· ὁ δ᾽αὐτὸς λόγος καὶ ἐπὶ πάντων τῶν ἀδιαιρέτων. συνεχεῖς μὲν δὴ οὐκ ἂν εἶεν διὰ τὸν εἰρημένον λόγον· ἅπτεται δ᾽ἅπαν ἢ ὅλον ὅλου ἢ μέρος μέρους ἢ ὅλου μέρος. ἐπεὶ δ᾽ἀμερὲς τὸ ἀδιαίρετον, ἀνάγκη ὅλον ὅλου ἅπτεσθαι. ὅλον δ᾽ὅλου ἁπτόμενον οὐκ ἔσται συνεχές. τὸ γὰρ συνεχὲς ἔχει τὸ μὲν ἄλλο τὸ δ᾽ἄλλο μέρος, καὶ διαιρεῖται εἰς οὕτως ἕτερα καὶ τόπῳ κεχωρισμένα." Translatio vetus, ed. BOSSIER, BRAMS, p. 216, l. 12-p. 217, l. 4: "Amplius necesse est aut etiam continua esse puncta aut tangentia se ad invicem, ex quibus est continuum – eadem autem ratio est et in omnibus indivisibilibus. Continua quidem igitur non erunt propter predictum locum; tangit autem omne aut totum totum aut pars partem aut totum pars. Quoniam autem inpartibile indivisibile est, necesse totum totum tangere. Totum autem totum tangens non est continuum; continuum enim habet hoc quidem aliam illud vero aliam partem, et dividitur in sic divisibilia et loco discreta." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 373): "Amplius, necesse est aut continua esse puncta, aut tangentia se ad invicem, ex quibus est continuum: eadem autem res est et in omnibus indivisibilibus. Continua igitur non erunt propter praedictam rationem. Tangit autem omne, aut totum totum, aut pars partem, aut totum pars. Quoniam autem impartibile est indivisibile, necesse est totum tangere totum. Totum autem totum tangens, non est continuum: continuum enim habet hoc quidem aliam, illud vero aliam partem; et dividitur in sic diversas et loco separatas." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem* commentariis, Venetiis 1562, f. 247rC-D): "Amplius necesse est aut continua esse puncta aut tangentia se inuicem, ex quibus est continuum. Eadem autem ratio est et in omnibus indiuisibilibus. Continua quidem non erunt propter dictam rationem. Tanget autem omne aut totum totum aut pars partem aut totum pars. Quoniam autem impartibile est ipsum indiuisibile, necesse est totum tangere totum. Totum autem totum tangens non erit continuum. Continuum nam habet hanc quidem aliam, illam vero aliam partem, et diuiditur in sic diuersas et loco separatas." Here it is to be noted that in the two 13th-century translations the final clause is more clearly rendered by using *separatas* instead of the *translatio vetus*' *discreta*.

The argument, as presented, relies on an implicit premiss: everything that is continuous is composed of parts which are continuous[94]. This premiss is, however, not immediately derivable from what Aristotle said in *Physics* V.3, and this points to an interesting tension (one which has not passed unnoticed by scholars) between two different conceptions of continuity which are at work in *Physics* V.3 and in *Physics* VI.1. In the case of *Physics* V.3, as seen, Aristotle had virtually nothing to say about the two objects which came to form a continuous entity by their sharing of their extremities. Such a definition of continuity is, indeed, relational in nature, as it represents the culmination of the analysis of spatial relations between objects presented in the chapter. Nevertheless, continuity is first and foremost a quantitative property of individual entities, rather than a relation obtaining between different entities, as Aristotle makes clear by remarking that two entities, becoming continuous, at the same time become a *per se* unity (albeit of the lowest degree). In *Physics* VI.1 Aristotle has completely abandoned the relational outlook which was central to *Physics* V.3, and he therefore considers the case of a single entity. Now, for such an entity to be continuous, Aristotle implicitly assumes, the property of continuity must obtain between *any* of its (quantitative) parts. In other words, whenever one considers any two parts of a continuous entity which are "next to" each other, they must turn out to be continuous, otherwise the entity considered will not be properly said to be continuous, since it will be possible to individuate two or more distinct boundaries within it. It is this understanding of continuity which, as it will become clear in what immediately follows, founds the connection between continuity and (potential) infinite divisibility.

Once this premiss is assumed the reconstruction of the second stage of the first argument becomes perspicuous:

Premiss 1: all the parts of a continuous entity are continuous (otherwise it would be possible to individuate two or more distinct boundaries within it).
Premiss 2: no continuous is an indivisible (by the conclusion of the first stage of the argument).
Conclusion: no part of a continuous entity is an indivisible.

[94] Although at the beginning of the quoted passage Aristotle explicitly allows also for the parts of a continuous entity to be merely in contact, the passage as a whole seems to suggest a more restrictive interpretation: the parts of a continuous entity are necessarily continuous.

This is certainly the most important stage of the argument, since it is only at this point that it is possible to infer the relation of logical entailment on which all the discussion of the subsequent chapters is based, namely, that continuity entails (potential) infinite divisibility, so that if an entity is continuous, it is necessarily (potentially) infinitely divisible, since it cannot be either indivisible as a whole or composed by indivisible (quantitative) parts.

In the second part of *Physics* VI.1 (cf. 231b18-232a22), Aristotle presents his second argument to show that, this time specifically, magnitudes, motion and time, being continuous, are neither indivisible nor composed of indivisible (quantitative) parts. This argument is based on the case of motion, and it is a *reductio ad absurdum* which shows how, starting from the assumption that a given magnitude is indivisible, or composed of indivisibles, a contradictory consequence ensues. While extremely important in itself, it should be remarked from the outset that this argument is part of the wider discussion of Zeno's paradoxes concerning motion, which Aristotle will develop throughout Book VI and especially in Book VII, chapter 5. Since this discussion goes beyond the scope of the thesis, I will not present it here; rather, I will just reconstruct the argument presented in this regard in *Physics* VI.1 and analyse some of its consequences as evident from the subsequent chapters of Book VI.

The second argument of *Physics* VI.1 is as follows:

> If a magnitude[95] is composed of indivisibles, the motion over that extension must be composed of corresponding indivisible motions: e.g. if the magnitude ABC is composed of the indivisibles A, B, C, each corresponding part of the motion DEF of Z over ABC is indivisible. Therefore, since where there is motion there must be something that is in motion, and where there is something in motion there must be motion, therefore the being-moved will also be composed of indivisibles. So Z traversed A when its motion was D, B when its motion was E, and C similarly when its motion was F. Now a thing that is in motion from one place to another cannot at the moment when it was in motion both be in motion and at the same time have completed its motion at the place to which it was in motion (e.g. if a man is walking to Thebes, he cannot be walking to Thebes and at the same time have completed his walk to Thebes); and, as we saw, Z traverses the partless section A in virtue of the presence of the motion D. Consequently, if Z actually passed through A after being in process of passing through, it neither was at rest nor had completed its passage at the same time, then that which is walking will at the moment when it is walking have

[95] Magnitude, as it has been made clear in the analysis of *Metaphysics* Δ.13, is used here as a term referring to entities endowed with either one, two or three dimensions. Yet, the argument applies, in its most simple form, specifically to linear motion, therefore motion along one dimension, and its conclusion can, of course, be extended to the case of two-dimensional and three-dimensional entities.

completed its walk and will be in the place to which it is walking; that is to say, it will have completed its motion at the place to which it is in motion. And if a thing is in motion over the whole ABC and its motion is DEF, and it is not in motion at all over the partless section A but has completed its motion over it, then the motion will consist not of motions but of movings, and will take place by a thing's having completed a motion without being in motion; for on this assumption it has completed its passage through A without passing through it. So it will be possible for a thing to have completed a walk without ever walking; for on this assumption it has completed a walk over a particular distance without walking over that distance. Since, then, everything must be either at rest or in motion, and it is therefore at rest in each of A, B and C, it follows that a thing can be at the same time continuously at rest and in motion; for, as we saw, it is in motion over the whole ABC and at rest in any part (and consequently in the whole) of it. Moreover, if the indivisibles composing DEF are motions, it would be possible for a thing in spite of the presence in it of motion to be not in motion but at rest; while if they are not motions, it would be possible for motion to be composed of something other than motions. And if length and motion are thus indivisible, it is similarly necessary that time also be indivisible, that is to say be composed of indivisible nows; for if every motion is divisible and bodies of equal velocity will move less in less time, the time must also be divisible; and if the time in which a thing is carried over A is divisible, A must also be divisible[96].

[96] ARISTOTELES, *Physica* VI.1, 231b21-232a22, ed. ROSS: "εἰ γὰρ τὸ μέγεθος ἐξ ἀδιαιρέτων σύγκειται, καὶ ἡ κίνησις ἡ τούτου ἐξ ἴσων κινήσεων ἔσται ἀδιαιρέτων, οἷον εἰ τὸ ΑΒΓ ἐκ τῶν ΑΒΓ ἐστὶν ἀδιαιρέτων, ἡ κίνησις ἐφ᾽ ἧς ΔΕΖ, ἣν ἐκινήθη τὸ Ω ἐπὶ τῆς ΑΒΓ, ἕκαστον τὸ μέρος ἔχει ἀδιαίρετον. εἰ δὴ παρούσης κινήσεως ἀνάγκη κινεῖσθαί τι, καὶ εἰ κινεῖταί τι, παρεῖναι κίνησιν, καὶ τὸ κινεῖσθαι ἔσται ἐξ ἀδιαιρέτων. τὸ μὲν δὴ Α ἐκινήθη τὸ Ω τὴν τὸ Δ κινούμενον κίνησιν, τὸ δὲ Β τὴν τὸ Ε, καὶ τὸ Γ ὡσαύτως τὴν τὸ Ζ. εἰ δὴ ἀνάγκη τὸ κινούμενον ποθέν ποι μὴ ἅμα κινεῖσθαι καὶ κεκινῆσθαι οὗ ἐκινεῖτο ὅτε ἐκινεῖτο (οἷον εἰ Θήβαζέ τι βαδίζει, ἀδύνατον ἅμα βαδι1ζειν Θήβαζε καὶ βεβαδικέναι Θήβαζε), τὴν δὲ τὸ Α τὴν ἀμερῆ ἐκινεῖτο τὸ Ω, ᾗ ἡ τὸ Δ κίνησις παρῆν· ῎ζστ᾽εἰ μὲν ὕστερον διεληλύθει ἢ διήει, διαιρετὴ ἂν εἴη (ὅτε γὰρ διήει, οὔτε ἠρέμει οὔτε διεληλύθει, ἀλλὰ μεταξὺ ἦν), εἰ δ᾽ἅμα διέρχεται καὶ διελήλυθε, τὸ βαδίζον, ὅτε βαδίζει, βεβαδικὸς ἐκεῖ ἔσται καὶ κεκινημένον οὗ κινεῖται. εἰ δὲ τὴν μὲν ὅλην τὴν ΑΒΓ κινεῖταί τι, καὶ ἡ κίνησις ἣν κινεῖται τὰ ΔΕΖ ἐστι, τὴν δ᾽ἀμερῆ τὴν Α οὐθὲν κινεῖται ἀλλὰ κεκίνηται, εἴη ἂν ἡ κίνησις οὐκ ἐκ κινήσεων ἀλλ᾽ἐκ κινημάτων καὶ τῷ κεκινῆσθαί τι μὴ κινούμενον· τὴν γὰρ Α διελήλυθεν οὐ διεξιόν. ὥστε ἔσται τι βεβαδικέναι μηδέποτε βαδίζον· ταύτην γὰρ βεβάδικεν οὐ βαδίζον ταύτην. εἰ οὖν ἀνάγκη ἢ ἠρεμεῖν ἢ κινῖσθαι πᾶν, ἠρεμεῖ καθ᾽ἕκαστον τῶν ΑΒΓ, ὥστ᾽ἔσται τι συνεχῶς ἠρεμοῦν ἅμα καὶ κινούμενον. τῆν γὰρ ΑΒΓ ὅλην ἐκινεῖτο καὶ ἠρε1μει ὁτιοῦν μέρος, ὥστε καὶ πᾶσαν. καὶ εἰ μὲν τὰ ἀδιαίρετα τῆς ΔΕΖ κινήσεις, κινήσεως παρούσης ἐνδέχοιτ᾽ἂν μὴ κινεῖσθαι ἀλλ᾽ἠρεμεῖν· εἰ δὲ μὴ κινήσεις, τῆν κίνησιν μὴ ἐκ κινήσεων εἶναι. ὁμοίως δ᾽ἀνάγκη τῷ μήκει καὶ τῇ κινήσει ἀδιαίρετον εἶναι τὸν χρόνον, καὶ συγκεῖσθαι ἐκ τῶν νῦν ὄντων ἀδιαιρέτων· εἰ γὰρ πᾶσα διαιρετός, ἐν τῷ ἐλάττονι δὲ τὸ ἰσοταχὲς δίεισιν ἔλαττον, διαιρετὸς ἔσται καὶ ὁ χρόνος. εἰ δ᾽ὁ χρόνος διαιρετὸς ἐν ᾧ φέρεταί τι τὴν Α, καὶ ἡ τὸ Α ἔσται διαιρετή." Translatio vetus, ed. BOSSIER, BRAMS, p. 217, l. 22-p. 220, l. 3: "Si enim magnitudo ex indivisibilibus componitur, et motus qui est huius ex equalibus motibus erit indivisibilibus, ut si ipsa abc- ex a- b- c- est indivisibilibus, motus autem in quo est dez-, secundum quem motum est ipsum o- in spatio quod est abc-, unamquamque partem habet indivisibilem. Si igitur presentis motus necesse (figura) est moveri aliquid et, si movetur aliquid, adesse motum, et movere erit ex indivisibilibus. Secundum quidem a- motum est ipsum o- motu quo d- movetur, secundum vero b- quo ipsum e-, et secundum c- similiter quo iprum z-. Si igitur necesse est quod movetur unde ubi, non simul est moveri et motum esse a quo movit quando movit, ut si Thebas aliquid it, inpossibile est simul ire Thebas et itum esse Thebas; secundum igitur a- inpartibilem motum est ipsum o-, secundum quod ipsum d- motus aderat. Quare si quidem posterius devenit quam venit, divisibilis utique erit; cum enim veniret, neque quiescebat neque transiens et medium erat; si autem simul venit et venerit, veniens, cum venit, ventum ibi erit et motum esse ubi movetur. Si vero secundum totum quidem abc- movetur aliquid, et motus quo movetur dez- est, secundum autem inpartibilem a- nichil movetur sed motum est, erit utique motus non ex motibus sed ex momentis et motum esse aliquid non motum; a- quidem enim transivit non transiens. Quare erit aliquid itum esse non aliquando iens; hanc enim transivit non transiens hanc. Si igitur necesse est aut quiescere aut moveri omne, quiescit autem unumquodque eorum que est abc-, ergo erit aliquid continue quiescens simul et quod movetur; per totam enim abc- movebatur et quiescebat

Aristotle's second argument takes as a premiss something which was stated explicitly in the first argument of *Physics* VI.1, namely, the fact that an indivisible does not have parts.

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quelibet pars, quare et per omnem. Et si quidem indivisibilia que sunt d- e- z- motus sunt, motus presentis contingeret utique non moveri sed quiescere; si autem non sunt motus, motum non ex motibus esse. Similiter autem necesse est longitudini et motui indivisibile esse et tempus, et componi ex ipsis nunc indivisibilibus; si enim omnis indivisibilis est, in minori autem equaliter velox transibit minorem, divisibile erit et tempus. Si autem tempus divisibile erit in quo feretur aliquid per ipsum a-, et que est ipsum a- divisibilis erit." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 377; p. 381): "Si enim magnitudo ex indivisibilibus componitur, et motus qui huius est, ex aequalibus erit motibus indivisibilibus. Ut si ipsa ABC ex ABC est indivisibilibus, et motus in quo DEZ, secundum quem motum est ipsum O in spatio quod est ABC, unamquamque partem habet indivisibilem. Si igitur praesentis motus necesse moveri per aliquam partem, et si moveatur aliquid, adesse motum; et moveri erit ex indivisibilibus. Secundum igitur A motum est ipsum O, motu quo D movetur; secundum vero B, quo ipsum E; et secundum C, quo ipsum Z. Si igitur necesse est quod movetur unde et quo, non simul moveri et motum esse, quo movit quando movet (ut si Thebas aliquis it, impossibile est simul ire Thebas et ivisse Thebas): Secundum A igitur impartibile motum est O secundum quod ipsum D motus aderat. Quare si posterius quidem devenerit quam venit, divisibile utique erit. Cum enim veniret, neque quiescebat neque transierat, sed in medio erat. Si autem simul venerit et venit veniens, cum venit, ventum ibi erit, et motum esse ubi movetur. Si vero secundum totum ABC moveatur aliquid, et motus quo movetur DEZ est; secundum autem impartibile A nihil movetur, sed motum est; erit utique motus non ex motibus, sed ex momentis. Et motum esse aliquid non motum: secundum enim A transivit non transiens. Quare erit aliquid transitum esse, non aliquando transiens: hanc enim transivit non transiens hanc. Si igitur necesse est aut quiescere aut moveri omne, quiescit autem per unumquodque eorum quae sunt A B C; ergo est aliquid continue quiescens simul et quod movetur. Per totam enim ABC movebatur, et quiescebat secundum quamlibet partem: quare et per totam. Et si indivisibilia quae sunt DEZ, motus sunt, motu praesente continget utique non moveri, sed quiescere. Si autem non sunt motus, motum non ex motibus esse. Similiter autem necesse longitudini et motui indivisibile esse tempus, et componi ex ipsis nunc existentibus indivisibilibus. Si enim omnis divisibilis est, in minori autem tempore aequaliter velox transibit minorem, divisibile erit et tempus. Si autem tempus divisibile erit in quo fertur aliquid per ipsum A, et quae est ipsum A erit divisibile." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem* commentariis, Venetiis 1562, f. 248vM; f. 249vG-H; f. 249vL-M; f. 250vH; f. 251rB-C; f. 251vH-I: "Si enim magnitudo ex indiuisibilibus componitur, et motus, qui huius est, ex aequalibus motibus erit indiuisibilibus, ut si ipsa ABC ex ipsis ABC sit indiuisibilibus, et motus in quo DEF, quo motum est ipsum P, super dimensionem ABC, unamquamque partem habet indiuisibilem. |f. 249vG| Si igitur, praesente motu, necesse est moueri quippiam, et, si mouetur quippiam, necesse est adesse motum, et moueri ipsum erit ex indiuisibilibus. Per A igitur motum est ipsum P, quo D motum est motu, B vero, quo ipsum E, et ipsum C similiter, quo F. Si igitur necesse est id, quod mouetur alicunde aliquo, non simul moueri, et motum esse, quo mouebatur, quin mouebatur (ut, si Thebas quis it, impossibile est simul ire Thebas et iuisse Thebas): per A igitur impartibile motum est ipsum P, quatenus D motus aderat. Quare, si posterius quidem transiuit, quam transibat, diuisibile utique erit. Cum enim transibat, neque quiescebat, neque transierat, sed in medio erat. Si autem simul transit et transiuit, id quod proficiscitur, cum proficiscitur, profectum eo erit, et motum quo mouetur. |f. 250vH| Si vero per totum ABC moueatur aliquid, et motus, quo mouetur, est DEF, per ipsum autem A impartibile nihil mouetur, sed motum est, erit utique motus non ex motibus, sed ex momentis, et motum esse aliquid non motum. A enim transiuit non transiens. Quare erit aliquid transisse nunquam transiens. Hoc enim non transiuit, non transiens hoc. |f. 251rB| Si igitur necesse est omne, aut quiescere, aut moueri, quiescit sane in unoquoque eorum, quae sunt ABC. Quare erit aliquid, quod continue quiescit simul, et mouetur. Per totum enim ABC mouebatur, et quiescebat secundum quamlibet partem, quare et per totum. Et, si indiuisibilia quidem DEF motus sunt, motu praesente, continget utique non moueri, sed quiescere, si vero non sunt motus, motum non ex motibus esse. |f. 251vH| Perinde autem necesse est atque longitudo motusque indiuisibile esse tempus, componique ex ipsis nunc, et his quidem indiuisibilibus. Si enim omnis diuisibilis est, in minore autem tempore aeque velox transibit minus, diuisibile erit et tempus. Si autem tempus diuisibile est, in quo fertur aliquid per A, et A erit diuisibile."

Therefore, if one admits the existence of an indivisible magnitude, there are no parts in such magnitude. If one now imagines a body moving over such an indivisible magnitude, the motion of the body cannot be divided in parts, since the magnitude on which it is moving has none. If this is so, however, it follows that the body considered will have "completed its motion [over an indivisible magnitude] without being in motion"[97]. The contradictory consequence of the argument is that something can be at the same time at rest and in motion, while traversing an indivisible magnitude. In order to avoid the contradiction, the premiss of the existence of an indivisible magnitude must be rejected. More formally:

Premiss 1: there exists an indivisible magnitude (by *fiat*).
Premiss 2: An indivisible magnitude has no parts (by its definition).
Premiss 3: the movement of a body over a magnitude can be divided according to the parts of the magnitude itself.
Premiss 4: the movement of a body over an indivisible magnitudes has no parts (by the conjunction of premisses 2 and 3).
Premiss 5: a body moving over an indivisible magnitude will have completed its motion without moving (a direct consequence of premiss 4).
Conclusion: a body moving over an indivisible magnitude is moving and at rest at the same time.

The conclusion is a contradiction, and the premiss to be rejected is premiss 1.

This should suffice as a (very succinct, admittedly) presentation of the argument[98]. Yet, a question remains as to the purpose of this second argument, which, in light of the above, appears to be less encompassing than the previous one. Here, indeed, Aristotle contents himself to show that magnitude, motion and time are neither indivisible nor composed of indivisible entities. Yet, this could not be sufficient to show at the same time that they are continuous, unless infinite divisibility was taken to entail continuity, although, in the case of the first argument, as seen, the direction of the entailment is rather the opposite

[97] This difficulty could be overcome by appealing to the notion of instantaneous velocity, something which Aristotle does not take into account, but that will be, most prominently, claimed by Epicurus, as it will be discussed in the next section of this chapter.
[98] The argument has an appendix concerning time. Since, however, the case of time lies beyond the scope of the thesis, I will content myself with the analysis of the abovementioned argument against the existence of indivisible magnitudes (and motions).

(continuity entails infinite divisibility). A possible solution, one which seems consistent with the structure and purpose of the chapter, is to consider the relation of entailment as reciprocal: whenever an entity (geometrical or sensible) is continuous, it is infinitely divisible, and whenever an entity (geometrical or sensible) is infinitely divisible, it is continuous[99].

The relation between continuity and infinite divisibility, however, becomes more complex when also *Physics* VI.2 is taken into account. Here Aristotle focuses explicitly on the case of time, and he shows, with an argument based on unequal velocities, that the infinite divisibility of motion (based on that of the magnitude traversed and, therefore, already demonstrated with the second argument of chapter VI.1) entails that of time (cf. VI.2, 232a23-232b23). It is at this point that Aristotle inserts the following problematic remark:

> I call continuous what is divisible into divisibles that are always divisible: and if this is assumed of the continuous [or, less literally: if the continuous is considered as such], it follows necessarily that time is continuous[100].

[99] Of course, the text of *Physics* VI.1 does not explicitly claims that divisibility entails continuity, while it certainly claims the inverse entailment, as shown. There are, however, other passages in the Aristotelian *corpus* where the claim that divisibility entails continuity is made explicit, at least in the case of magnitudes (which is the one central for the purposes of the chapter): cf., for instance, *De caelo* I.1, 268a28-29: "All magnitudes, then, which are divisible are also continuous", a passage which is also closely mirrored by one in the *Physics* (cf. *Physics* III.1, 200b16-20), where, after having stated that motion belongs to the class of continuous entities, Aristotle says that "[…] the infinite presents itself first in the continuous – that is how it comes about that the account of the infinite is often used in definitions of the continuous; for what is infinitely divisible is continuous." Interestingly, while the passage from the *De caelo* primarily refers to magnitudes, that from the *Physics* primarily refers to motion: not only they fittingly complement each other, but this complementarity also strongly suggests that the principle according to which infinite divisibility entails continuity is conceived by Aristotle as applying to all kinds of continuous entities.

[100] ARISTOTELES, *Physica* VI.2, 232b24-26, ed. ROSS: "λέγω δὲ συνεχὲς τὸ διαιρετὸν εἰς αἰεὶ διαιρετά· τούτου γὰρ ὑποκειμένου τοῦ συνεχοῦς, ἀνάγκη συνεχῆ εἶναι τὸν χρόνον." Translatio vetus, ed. BOSSIER, BRAMS, p. 222, ll. 14-16: "Dico autem continuum divisibile in semper divisibilia; huiusmodi enim subiecto continuo, necesse est continuum esse tempus." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 381): "Dico autem continuum, quod est divisibile in semper divisibilia. Huiusmodi enim supposito continuo, necesse est et tempus continuum esse." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem* commentariis, Venetiis 1562, f. 255rD): "Dico autem continuum id quod est diuisibile in semper diuisibilia. Tali enim supposito continuo necesse est continuum esse tempus." It should be remarked that both Moerbeke's translation and the Arabic-Latin one capture in an adequate (albeit less literal) way the meaning of the Greek genitive absolute, whilst Jacob's translation is more literal but, at the same time, significantly more obscure.

The obvious question that the passage raises is whether it is possible to individuate in it a new definition of continuity, namely, that of continuity as infinite divisibility, or not. Modern scholars, following Wieland[101], have frequently admitted that what this passage presents is a new definition of continuity, and, therefore, that the relation between this definition and the one most prominently presented in *Physics* V.3 stands in need of clarification. Wieland is even convinced that it is only at this point that Aristotle presents his true definition of the continuous. Others have favoured more moderate positions, yet without being able to do away with the tension completely.

Although it is not possible to examine the debate in its entirety here, I focus on Wieland's position, both for its importance in secondary literature and for its extreme stand. Wieland's thesis is founded upon the idea that, for Aristotle, the property of continuity is defined by its irreducibility to something which is different from itself, that is, to something that is not continuous. In this sense a continuous entity can only be divided in entities that are continuous and that, therefore, in their own turn, can only be divided in further continuous entities, and so on *ad infinitum*. Wieland, therefore, takes this *formal* aspect to represent the defining feature of continuity. This idea captures, I believe, a fundamental aspect of Aristotle's conception of continuity. Nevertheless, it is not sufficient to make sense of the perspective adopted by Aristotle in *Physics* V.3, where it is clear, as I have shown above, that continuity is rather defined by the fact that the parts composing a continuous entity become unified to the point of being "indistinguishable" one from the other. In this sense, continuity, in Aristotle, is defined by the fact it identifies something that is, in a relevant sense, a mereologically simple structure, one where there are no parts in act, but only parts that can be actualised by the process of division. Wieland recognises this further feature of Aristotle's concept of continuity, but he does not consider it the defining one. Still, if one does not define continuity in such terms, the extremely tight link between continuity and unity in the *Categories* and, especially, in the *Metaphysics*, becomes entirely unintelligible, as it does the overall structure of *Physics* V.3, which clearly aims to define continuity by starting from entities that are entirely separate and reaching entities that are united to such a point as to have formed a new,

[101] Cf. WIELAND, *Die aristotelische Physik. Untersuchungen über die Grundlegung der Naturwissenschaft und die sprachlichen Bedingungen der Prinzipienforschung bei Aristoteles*, *op. cit*., and also W. WIELAND, *Das Kontinuum in der Aristotelischen Physik*, in G.A. SEECK (ed.), *Die Naturphilosophie des Aristoteles*, Darmstadt, Wissenschaftliche Buchgesellschaft, 1975, pp. 251-300.

mereologically simple one. All these aspects, admittedly central to Aristotle's doctrine of continuity, are ultimately lost, unless one takes as the only true definition of continuity the one provided by Aristotle in *Physics* V.3 (which, on the contrary, still allows to derive the formal aspect underlined by Wieland and also, more generally, a co-implication between continuity and (potential) infinite divisibility).

Moreover, whether or not (as I believe) the passage at stake can represent a new (or even the only) definition of continuity in the Aristotelian *corpus*, it should also be remembered that there are strong textual reasons to think that, *in Aristotle's intention*, only the definition of *Physics* V.3 counts as a true definition of continuity. First, as seen, in beginning his discussion in *Physics* VI.1 he explicitly says that the term 'continuous', together with 'in succession' and 'touching', has already been defined, clearly referring back to V.3, and therefore he takes the definition given in V.3 as the *basis* for the ensuing discussion conducted in Book VI. Moreover, in this passage Aristotle nowhere states explicitly that he is giving a definition (i.e., that he is indicating the 'τί ἐστιν') of 'continuous'[102]. This aspect has, I think, been unjustly forgotten by modern interpreters. I am fully convinced, instead, that this observation holds the key to the solution of the problem. If, indeed, as I argued above, there is a relation of co-implication between continuity and (potential) infinite divisibility, so that not only whatever is continuous is also (potentially) infinitely divisible but, reciprocally, whatever is (potentially) infinitely divisible is also continuous, then what Aristotle is truly claiming in this passage is that it is possible to take the fact that a given entity (such as time in this case) is (potentially) infinitely divisible as evidence for the fact that it is also continuous. Still, continuity, according to Aristotle, cannot be defined as (potential) infinite divisibility.

Whatever the correct interpretation of this passage, it is obvious that its wording reinforces the idea of an intimate connection between continuity and (potential) infinite divisibility, and it is exactly this connection which will influence significantly the tradition of the commentators. The whole problem of Aristotelian *minima*, as I have already stated and as I will make abundantly clear in subsequent chapters of the thesis,

[102] As he did, instead, in *Physics* V.3 226b18-20 (cf. also *ibid*., 227a32-227b2). Here Aristotle instead talks of something which ὑποκεῖσθαι regarding the continuous, a term which usually indicates in the Aristotelian *corpus*, when used as part of an absolute genitive, a presupposition, or an assumption, regarding a given subject, but certainly not a definition (cf., for instance, *Politics* 1289).

takes as its necessary premiss that, at the very least, whatever is continuous is (infinitely) divisible.

Nevertheless, before turning to the Late Ancient, Averroistic, and Medieval reception of this idea, it is important to present a set of texts from the *De generatione et corruptione* where Aristotle reinforces this idea in the course of a long and significant polemic against the atomists.

1.2.4. Arguments against Atomism in *De generatione et corruptione* I.2

De generatione et corruptione I.2 is significant in many respects, and I will not even attempt to provide a comprehensive analysis of it here[103]. The importance of the chapter for this thesis lies specifically in the way in which atomists' arguments concerning natural magnitudes are introduced, praised and then rebutted, as Aristotle will go on to do in I.8, which is the subject of the next section. The recognition of the importance of the atomists' doctrines, as well as the insistence to rebut them, make these two chapters fundamental in setting a clear limit to the possibility of conceiving magnitudes as composed of indivisibles. In this sense, these two chapters complement Aristotle's arguments in *Physics* V.3 and VI.1-2, showing negatively what had been shown positively there, namely, that magnitudes are continuous and continuity entails (potential) infinite divisibility.

Chapter I.2 is dedicated to surveying the views of predecessors concerning the issue at stake in the work, namely, substantial change (i.e., coming to be and passing away, or, more shortly, generation and corruption). A first point that Aristotle notices here is that all his predecessors, and Plato most prominently, limited their investigation to the generation and corruption of the elements, and, moreover, were not able to distinguish in a principled way the conditions of substantial change and alteration respectively. However, as Aristotle somewhat surprisingly remarks, there is one exception to this criticism, namely, the atomists. In his brief, although clear and effective, presentation of the atomists' explanatory principles and of their method, Aristotle singles them out for two elements, which make them particularly worth of praise. First, atomists

[103] For this, see D. SEDLEY, On Generation and Corruption *I.2*, in F. DE HAAS, J. MANSFELD (eds.), *Aristotle's* On Generation and Corruption *I (Symposium Aristotelicum)*, Oxford, Oxford University Press, 2004, pp. 65-90.

have a principled way to distinguish between the conditions of "substantial change" (i.e., the joining and separating of atoms respectively) and of "alteration" (i.e., the fact that a certain number of atoms of the same kind comes together and the various ways in which they change their position within the same aggregate), and, what is more, they do it with the aid of the same principles, i.e., atoms and void. Secondly, Aristotle praises the commitment of the atomists to make their explanations consistent with perceptual evidence.

In respect of this second aspect, Aristotle is particularly keen on contrasting the reasons that brought the atomists to adopt atomic magnitudes as principles (i.e., perceptual evidence) and those which brought Platonists to the same conclusion (i.e., a theoretical necessity stemming from commitments completely foreign to the observation of natural phenomena).

It is at this point that, with the purpose of exemplifying an appropriate Democritean argument in natural philosophy, Aristotle quotes (and then refutes) an objection raised by Democritus against the (potential) infinite divisibility of magnitudes. The argument is extremely important in the context of this chapter since it presents a fundamental dilemma that arises when claiming that magnitudes are infinitely divisible, and thus allows Aristotle to deepen and restate his commitment to this thesis already set forth in *Physics* VI.1-2. The dilemma, which has been named as the "dilemma of divisibility" by Fred Miller, Jr.[104], is introduced by Aristotle as follows: "Since, therefore, the body is divisible through and through, let it have been divided. What, then, will remain?" (316a23-24)[105].

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[104] Cf. MILLER., JR., *Aristotle against the Atomists, op. cit.* Miller explicitly refers, here, to the (substantially identical) way in which the dilemma is formulated in *De generatione* I.8. Yet, I believe that, discussing the two chapters in systematic order, it is better to introduce the dilemma as presented in *De generatione* I.2 and, therefore, to use the expression in the context of the discussion conducted throughout this chapter.

[105] ARISTOTELES, *De generatione et corruptione*, ed. H.H. JOACHIM, *Aristotle* On Coming-to-be and Passing-away. *A Revised Text with Introduction and Commentary*, Oxford, Clarendon Press, 1922: "Επεὶ τοίνυν πάντῃ τοιοῦτον ἐστι τὸ σῶμα, διῃρήσθω. Τί οὖν ἔσται λοιπόν;" Translatio vetus (ARISTOTELES LATINUS, *De generatione et corruptione. Translatio vetus (Aristoteles Latinus IX.1)*, ed. J. JUDYCKA, Leiden, Brill, 1976, p. 12, ll. 8-9): "Quoniam igitur omnino tale est corpus, dividatur. Quid igitur erit reliquum?" Translatio Guillelmi (ARISTOTELES LATINUS, *De generatione et corruptione. Recensio Guillelmi de Moerbeka (Aristoteles Latinus IX.2)*, ed. J. JUDYCKA, available online at Aristoteles Latinus Database, URL <http://apps.brepolis.net/LTool/Entrance.aspx?w=9&a=%2fald%2fDefault.aspx>, last consulted on January 31st, 2023): "Quoniam igitur omnino tale est corpus, dividatur. Quid igitur erit reliquum?" Note that, apart from the two Greek-Latin extant translations just quoted (the *vetus*, to be attributed to Burgundius of Pisa, and the revision of that translation to be attributed to William of Moerbeke), eight manuscripts, according to the *Aristoteles Latinus*, preserve also an Arabic-Latin translation of the work (the Arabic text is lost), sometimes accompanied by the *translatio vetus*, although

The dilemma is constituted by what Miller dubs a "nihilistic" horn and what he calls an "atomistic" one. The nihilistic horn is itself divided in two (equally unpalatable) alternatives:

> A magnitude? No: that is impossible, since then there will be something not divided, whereas *ex hypothesi* the body was divisible through and through. But if it be admitted that neither a body nor a magnitude will remain, and yet division is to take place, the constituents of the body will either be points (i.e. without magnitude) or absolutely nothing[106]. If its constituents are nothings, then it might both come-to-be out of nothings and exist as a composite of nothings: and thus presumably the whole body will be nothing but an appearance. But if it consists of points, a similar absurdity will result: it will not possess any magnitude. For when the points were in contact and coincided to form a single magnitude, they did not make the whole any bigger (since, when the body was divided into two or more parts, the whole was not a bit smaller or bigger than it was before the division): hence, even if all the points be put together, they will not make any magnitude[107].

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this translation which had a very limited influence on the reception of the work in the Latin world (cf. ARISTOTELES LATINUS, *De generatione et corruptione. Translatio vetus*, ed. JUDYCKA, pp. IX-X, and also G. SERRA, "Note sulla traduzione arabo-latina del *De generatione et corruptione* di Aristotele", *Giornale critico della filosofia italiana* 4 (4) [52 (54)], 1973, pp. 383-427.

[106] Aristotle further notes that saying that a body is divided into extremely small magnitudes is not a suitable way out of the dilemma, since, insofar as such extremely small magnitudes are still divisible, they can be divided into something smaller, and, ultimately, the dilemma applies to them as well.

[107] ARISTOTELES, *De generatione et corruptione* I.2, 316a24-34, ed. JOACHIM: "μέγεθος; οὐ γὰρ οἷόν τε· ἔσται γάρ τι οὐ διῃρημένον, ἦν δὲ πάντῃ διαιρετόν. Ἀλλὰ μὴν εἰ μηδὲν ἔσται σῶμα μηδὲ μέγεθος, διαίρεσις δ᾽ἔσται, ἢ ἐκ στιγμῶν ἔσται, καὶ ἀμεγέθη ἐξ ὧν σύγκειται, ἢ οὐδὲν παντάπασιν, ὥστε κἂν γίνοιτο ἐκ μηδενὸς κἂν εἴη συγκείμενον, καὶ τὸ πᾶν δὴ οὐδὲν ἄλλ᾽ἢ παινόμενον. Ὁμοίως δὲ κἂν ᾖ ἐκ στιγμῶν, οὐκ ἔσται ποσόν. Ὁπότε γὰρ ἥπτοντο καὶ ἓν ἦν μέγεθος καὶ ἅμα ἦσαν, οὐδὲν ἐποίουν μεῖζον τὸ πᾶν· διαιρεθέντος γὰρ εἰς δύο καὶ πλείω, οὐδὲν ἔλαττον οὐδὲ μεῖζον τὸ πᾶν τοῦ πρότερον· ὥστε κἂν πᾶσαι συντεθῶσιν, οὐδὲν ποιήσουσι μέγεθος." Translatio vetus, ed. JUDYCKA, p. 12, ll. 9-19: "Dimensio? Non enim possibile; erit enim quid non divisum, erat autem omnino divisibile. Sed si nullum erit corpus neque dimensio, divisio autem erit, aut ex punctis erit et sine dimensione erunt ex quibus compositum est, aut nichil omnino. Quapropter et generabitur ex nichilo et erit compositum, et omne utique nichil, sed tantum apparens. Similiter autem et si erit ex punctis, non erit quantum. Quando enim tangebant et una erat dimensio et simul erant, non faciebant maius omne; diviso enim in duo vel plura, non minus neque maius omne prioris; quapropter et si omnes componantur, nullam faciunt dimensionem." Translatio Guillelmi, ed. JUDYCKA: "Magnitudo? Non enim possibile; erit enim quid non divisum, erat autem omnino divisibile. Sed si nullum erit corpus neque magnitudo, divisio autem erit, aut ex punctis erit et sine dimensione erunt ea ex quibus compositum est, aut nichil omnino. Quapropter et generabitur ex nichilo et erit compositum, et omne utique nichil, sed tantum apparens. Similiter autem si erit ex punctis, non erit quantum. Quando enim tangebant et una erat magnitudo et simul erant, non faciebant maius omne; diviso enim in duo vel plura, non minus neque maius omne priore; quapropter et si omnes componantur, nullam faciunt magnitudinem." It is to be remarked that, in this as in other cases, Moerbeke's revision of Burgundius' translation focuses on some terms which are rendered in a more literal way, such as, in this case, especially *magnitudo* (on the salient features of Moerbeke's revision of the translatio vetus, see esp. J. JUDYCKA, *L'attribution de la Translatio Nova du* De generatione et corruptione *à Guillaume de Moerbeke*, in J. BRAMS, W. VANHAMEL (eds.), *Guillaume de Moerbeke. Recueil d'études à l'occasion du 700e anniversaire de sa mort (Ancient and Medieval Philosophy. De Wulf-Mansion Centre Series 1, 7)*, Leuven, Leuven University Press, 1989, pp. 247-252, and also ARISTOTELES LATINUS, *De generatione et corruptione*, ed. JUDYCKA, pp. XI-XII). The Greek has μέγεθος and, while also Burgundius normally translates it with *magnitudo*, in this passage, where, evidently, the meaning is closer to extension, rather than magnitude, he chooses *dimensio*, which clearly gives the idea of including any entity (sensible or geometrical) extended in either one, two, or three

If a body is infinitely divisible, then by dividing it completely either what remains are points (i.e., unextended indivisible entities), or nothing at all. In both cases, an impossible conclusion ensues: either the body divided is composed of unextended entities (but from unextended components it is impossible to form an extended entity) or the body divided is composed of nothing, i.e., it is not a real body, but what Aristotle calls a mere "appearance" (something, that is, which cannot aspire to the status of 'body')[108].

The "atomistic" horn of the dilemma is presented by Aristotle in what follows:

> Since, therefore, it is impossible for magnitudes to consist of contacts or points, there must be indivisible bodies and magnitudes. Yet, if we do postulate the latter, we are confronted with equally impossible consequences, which we have examined in other works [cf. especially *Physics* VI][109].

Here Aristotle merely refers to the arguments against the idea that magnitudes (but also motion and time, and, more in general, any continuous quantity) are composed of indivisible entities which he discussed in *Physics* VI (among which a prominent place is certainly held by what I classified as the second argument of *Physics* VI.1).

At this point Aristotle proposes a first possible solution to the dilemma:

> On the one hand, then, it is in no way paradoxical that every perceptible body should be indivisible as well as divisible at any and every point. For the second predicate will attach to it potentially, but the first actually[110].

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dimensions. Moerbeke's choice, while uniforming the text, determines at the same time a semantical shift in the understanding of this passage.

[108] To be precise, Aristotle also presents a series of additional difficulties following from the idea that a body is ultimately composed of points (or of nothing at all). Indeed, Aristotle further notices that it should always be possible to build a body all over again by putting together its ultimate components. Yet, if the body is divided into points (or nothing at all) it will be utterly impossible to build it all over again, even if we assume that such components are (forms of) qualities or other accidents.

[109] ARISTOTELES, *De generatione et corruptione* I.2, 316b14-18, ed. JOACHIM: "ὥστ᾽εἴπερ ἀδύνατον ἐξ ἀφῶν ἢ στιγμῶν εἶναι τὰ μεγέθη, ἀνάγκη εἶναι σώματα ἀδιαίρετα καὶ μεγέθη. Οὐ μὴν ἀλλὰ καὶ ταῦτα θεμένοις οὐχ ἧττον συμβαίνει ἀδύνατα· ἔσκεπται δὲ περὶ αὐτῶν ἐν ἑτέροις." Translatio vetus, ed. JUDYCKA, p. 14, ll. 1-4: "Quapropter si inpossibile ex punctis esse magnitudinem, necesse esse corpora indivisibilia et magnitudines. Sed et hec ponentibus non minus contingit inpossibile. Scrutatum autem est de his in aliis." Translatio Guillelmi, ed. JUDYCKA: "Quapropter si inpossibile ex TACTIBUS AUT punctis magnitudinem esse, necesse est corpora indivisibilia esse et magnitudines. Sed et hec ponentibus non minus CONVENIT inpossibile. Scrutatum autem est de his in aliis."

[110] ARISTOTELES, *De generatione et corruptione* I.2, 316b19-21, ed. JOACHIM: "Τὸ μὲν οὖν ἅπαν σῶμα αἰσθητὸν εἶναι διαιρετὸν καθ᾽ὁτιοῦν σημεῖον καὶ ἀδιαίρετον οὐδὲν ἄτοπον· τὸ μὲν γὰρ δυνάμει, τὸ δ᾽ἐντελεχείᾳ ὑπάρξει." Translatio vetus, ed. JUDYCKA, p. 14, ll. 6-8: "Omne quidem igitur corpus sensibile

The solution would, therefore, simply consist in admitting that any (perceptible) body is always *potentially* infinitely divisible, yet it can never be so divided in act[111]. Nevertheless, Aristotle immediately notes that a reply is open to the atomist:

> On the other hand, it would seem to be impossible for a body to be, even potentially, divisible at all points simultaneously. For if it were possible, then it might actually occur, with the result, not that the body would simultaneously be actually both (indivisible and divided), but that it would be simultaneously divided at any and every point. Consequently, nothing will remain and the body will have passed away into what is incorporeal: and so it might come to be again either out of points or absolutely out of nothing. And how is that possible?[112].

This objection is based on an attentive consideration of the notion of potency, which, by definition, implies that something might happen, even if it has never happened and if the probability of it happening in the future is almost null. If this is so, Aristotle continues, then the dilemma presents itself again in the same fashion, since, in the case that the potential infinite divisibility of a body were to be actualised, then it would follow that either what remains is nothing at all (or an unextended entity), or it is an indivisible entity.

Given the unacceptability of the nihilistic horn, it would therefore seem that the only solution to the dilemma is the acceptance of the atomistic one. Yet, Aristotle at this point proposes a second (and, he believes, definitive) solution to the dilemma, one which allows him to avoid any commitment to the existence of atomic (indivisible) magnitudes,

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esse divisibile secundum quodcumque signum et indivisibile, non inconveniens; hoc enim potestate, hoc autem entelechia existit." Translatio Guillelmi, ed. JUDYCKA: "Omne quidem igitur corpus sensibile esse divisibile secundum quodcumque signum et indivisibile, non est inconveniens; hoc enim potestate, hoc autem endelichia existit." It is noteworthy that in both latin translations ἐντελέχεια is merely translitterated.

[111] Aristotle, as is well known, does not accept the existence of the actual infinite.

[112] ARISTOTELES, *De generatione et corruptione* I.2, 316b21-27, ed. JOACHIM: "Τὸ δ᾽εἶναι ἅμα πάντῃ διαιρετὸν δυνάμει ἀδύνατον δόξειεν ἂν εἶναι. Εἰ γὰρ δυνατόν, κἂν γένοιτο (οὐχ ὥστε ἅμα εἶναι ἄμφω ἐντελεχείᾳ, ἀδιαίρετον καὶ διῃρημένον, ἀλλὰ διῃρημένον καθ᾽ὁτιοῦν σημεῖον)· οὐδὲν ἄρα ἔσται λοιπόν, καὶ εἰς ἀσώματον ἐφθαρμένον τὸ σῶμα, καὶ γίγνοιτο δ᾽ἂν πάλιν ἤτοι ἐκ στιγμῶν ἢ ὅλως ἐξ οὐδενός. Καὶ τοῦτο πῶς δυνατόν;" Translatio vetus, ed. JUDYCKA, p. 14, ll. 8-14: "Esse autem simul omnino divisibile potestate inpossibile videbitur utique esse. Si enim possibile, et fieret; non ut sit simul actu ambo, indivisibile et divisum, sed divisum secundum quodcumque signum. Nullum igitur erit reliquum et in incorporeum corruptum corpus, et generabitur utique rursus aut ex punctis, aut omnino ex nichilo. Et hoc quomodo possibile?" Translatio Guillelmi, ed. JUDYCKA: "Esse autem omnino simul divisibile potestate inpossibile utique videbitur esse. Si enim possibile, et fieret; non ut sit simul actu ambo, indivisibile et divisum, sed divisum secundum quodcumque signum. Nullum igitur erit reliquum et in incorporeum CORRUMPI ESSET corpus, et generabitur utique rursus aut ex punctis, aut omnino ex nichilo. Et hoc quomodo possibile?"

without, at the same time, having to accept that the division of a magnitude ultimately resolves it into nothing at all or into points (unextended indivisible entities)[113]:

> Such is the argument which is believed to establish the necessity of atomic magnitudes: we must now show that it conceals a faulty inference, and exactly where it conceals it. For, since point is not 'immediately-next' to point, magnitudes are 'divisible through and through' in one sense, and yet not in another. When, however, it is admitted that a magnitude is 'divisible through and through', it is thought there is a point not only anywhere, but also everywhere, in it: hence it is supposed to follow, from the admission, that the magnitude is 'divisible through and through', viz. in so far as there is one point anywhere within it and all its points are everywhere within it if you take them singly one by one. But there are not more points than one anywhere within it, for the points are not 'consecutive': hence it is not simultaneously 'divisible through and through'. For if it were, then, if it be divisible at its centre, it will be divisible also at a point 'immediately-next' to its centre. But it is not so divisible: for position is not 'immediately-next' to position, nor point to point – in other words, division is not 'immediately-next' to division, nor composition to composition[114].

[113] It cannot be stressed enough that this solution does not amount to an argument against atomism. Aristotle's attack on atomism, apart from the arguments of *Physics* VI (on which see the previous subsection) will find its place in *De generatione et corruptione* I.8 (on which see the following subsection).

[114] ARISTOTELES, *De generatione et corruptione* I.2, 316b34-317a12, ed. JOACHIM: "Ὁ μὲν οὖν ἀναγκάζειν δοκῶν λόγος εἶναι μεγέθη ἄτομα οὗτός ἐστιν· ὅτι δὲ λανθάνει παραλογιζόμενος, καὶ ᾗ λανθάνει, λέγωμεν. Ἐπεὶ γὰρ οὐκ ἔστι στιγμὴ στιγμῆς ἐχομένη, τὸ πάντῃ εἶναι διαιρετὸν ἔστι μὲν ὡς ὑπάρχει τοῖς μεγέθεσιν, ἔστι δ᾽ὡς οὔ. Δοκεῖ δ᾽, ὅταν τοῦτο τεθῇ, καὶ ὁπηοῦν καὶ πάντῃ στιγμὴν εἶναι, ὥστ᾽ἀναγκαῖον εἶναι διαιρεθῆναι τὸ μέγεθος εἰς μηδέν – πάντῃ γὰρ εἶναι στιγμήν, ὥστε ἢ ἐξ ἁφῶν ἢ ἐκ στιγμῶν εἶναι. Τὸ δ᾽ἐστὶν ὡς ὑπάρχει πάντῃ, ὅτι μία ὁπηοῦν ἐστι καὶ πᾶσαι ὡς ἑκάστη· πλείους δὲ μιᾶς οὐκ εἰσίν (ἐφεξῆς γὰρ οὐκ εἰσίν), ὥστ᾽οὐ πάντῃ. Εἰ γὰρ κατὰ μέσον διαιρετόν, καὶ κατ᾽ἐχομένην στιγμὴν ἔσται διαιρετόν· <οὐκ ἔστι δέ,> οὐ γάρ ἐστιν ἐχόμενον σημεῖον σημείου ἢ στιγμὴ στιγμῆς, τοῦτο δ᾽ἐστὶ διαίρεσις ἢ σύνθεσις." Translatio vetus, ed. JUDYCKA, p. 15, ll. 1-13: "Cogens igitur sermo esse magnitudines indivisibiles, hic est; quoniam autem latet paralogyzans, et quomodo latet, dicamus. Quoniam enim non est punctus puncto contiguus, undique esse divisibile est quidem qualiter existit magnitudinibus, est autem qualiter non. Videtur autem, quando hoc ponitur, et undique et ubique punctus esse, quapropter necesse dividere magnitudinem in nichil, ubique enim esse punctum; quapropter aut ex tactibus aut ex punctis esse. Hoc autem est quod existit ubique, quoniam una undique et omnes ut unaqueque, plures autem una non sunt; contigue enim non sunt; quapropter non ubique. Si enim secundum medium divisibile, et secundum contiguum punctum erit divisibile. Non autem: non enim est contiguum signum signo aut punctum puncto, hoc autem est divisio aut compositio." Translatio Guilllelmi, ed. JUDYCKA: "Cogens igitur sermo magnitudines esse indivisibiles, hic est; quoniam autem latet paralogizans, et quomodo latet, dicamus. Quoniam enim non est punctus puncto contiguus, undique esse divisibile est quidem qualiter existit magnitudinibus, est autem qualiter non. Videtur autem, quando hoc ponitur, et undique et ubique punctus esse, quapropter necesse dividere magnitudinem in nichil, ubique enim esse punctum; quapropter aut ex tactibus aut ex punctis esse. Hoc autem est UT existit ubique, quoniam UNUS UBICUMQUE et omnes ut UNUSQUISQUE, plures autem UNO non sunt; CONSEQUENTER enim non sunt; quapropter non ubique. Si enim secundum medium divisibile, et secundum HABITUM punctum erit divisibile. Non autem possibile; non enim est HABITUM signum signo aut PUNCTUS puncto, hoc autem est divisio aut compositio."

Now, the passage has traditionally troubled interpreters, and its meaning remains far from clear[115]. The key element to understand Aristotle's argument is the assumption that points (or any other indivisible entities)[116] are never consecutive (and, *a fortiori*, neither contiguous nor continuous)[117]. Indeed, between any two points, according to Aristotle, there is always a line, since points exist insofar as they are limits of a line (and indivisibles in general insofar as they are limits of magnitudes)[118]. If this is so, then, the main problem that Aristotle sees with the atomists' objection is constituted by a conceptual-ontological element, namely, by the way in which he conceives of indivisible entities. Since a point (and, of course, any other indivisible magnitude) has only an ontologically "derivative" existence, as the limit of a line[119], which comes to exist in act by the operation of division of a given line, then the actual existence of a point entails the actual existence of the line of which it is a limit. If, however, a point were "next to" another point, there could not be any line between them, that is to say, the points would come to exist as ontologically independent entities, without any reference to lines.

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[115] In what follows, I mostly adhere to the interpretation proposed by MILLER, JR., *Aristotle Against the Atomists*, *op. cit.* (which develops and completes the basic remarks presented by D.J. FURLEY, *Two Studies in the Greek Atomists (Princeton Legacy Library 2406)*, Princeton, NJ, Princeton University Press, 1967), albeit simplifying and resuming its main elements. I particularly agree with Miller in his criticism of the interpretations proposed, most prominently, by Joachim and Ross, according to which the key to the understanding of the passage is represented by a distinction between 'simultaneous' and 'successive' divisions. Apart form the fact that such a distinction does not play any role in the text, even conceptually it is not helpful in providing a solution to the problem Aristotle is facing. Williams (cfr. ARISTOTLE, *Aristotle's* De generatione et corruptione. *Translated with Notes (Clarendon Aristotle Series)*, C.J.F. WILLIAMS (trans.), Oxford, Clarendon Press, 1982) has a partially different approach, one that makes use of the tools of modal logic in order to distinguish various senses of 'everywhere divisible' and 'anywhere divisible'. While I think that he is going in the right direction (also in criticising the approach of those, like Joachim and Ross, who interpret the passage as distinguishing between simultaneous and successive divisions; see p. 75 of his commentary), his approach overcomplicates the issue at stake and shifts its focus from the key to the passage, which is represented by the ontology of points, as Miller correctly remarks. It is in any case significant of the complexity of the passage what Williams remarks in his commentary: "[t]he above paraphrase of 317a2-12 is the nearest I can come to making sense of this baffling passage. A large part of it, 317a8-12, is so resistant to my attempts to understand it that I have contented myself with a literal translation which I have placed between obeli to indicate that no claim is made to have found a sure way of making sense of the Greek. Other commentators and translators seem to have fared no better, and I can hope to surpass them only in frankness" (ARISTOTLE, *Aristotle's* De generatione et corruptione, WILLIAMS (trans.), *op. cit.*, p. 74). *Pace* Williams, I think that it is possible to provide a reasonably good understanding of the passage along the lines proposed by Miller.

[116] Of course, the argument concerns merely *unextended* indivisible entities, be they abstracted from a sensible magnitude or taken as geometrical points of (already abstracted) geometrical lines.

[117] For Aristotle's arguments in support of this assumption, cf. *Physics* VI.1 and *supra*, in the previous subsection.

[118] For this characterisation of points as limits (πέρατα) of lines (more precisely, of segments of lines) see especially *Metaphysics* B.5, 1002b10, K.2, 1060b16, N.3, 1090b9, and also *Physics* IV.11, 220a10.

[119] Aristotle explicitly claims that points have only accidental being in *Metaphysics* E.2, 1026b22-24.

It is this the reason why Aristotle distinguishes between points 'anywhere' and points 'everywhere' in a given magnitude: the magnitude can be divided at any point, yet not at all its points together, not even potentially (be that by a simultaneous or a successive process of division). This also explains the example Aristotle presents: "if it [i.e., a given magnitude, say, a straight line] be divisible at its centre, it will be divisible also at a point immediately-next to its centre. But it is not so divisible". Now, imagine that one decides to divide a given straight line segment, AB, at its centre, C. The point C exists only insofar as it is the limit of two line segments, namely, AC and CB. If, then, one wants to further divide the line, it is possible to do so at any other point both on the segment AC and on the segment CB, but not at the two points which would lie "immediately-next" to C (and also to A and B, for that matter), call them C' and C''. Indeed, by Aristotle's definition of 'immediately next', or 'consecutive', there cannot be any point (therefore any line segment) between C' and C, or C and C'', with the consequence that, by dividing AB at C' and CB at C'', C would cease to be the limit of any line segment: it would have come to be an ontologically independent entity, something which contradicts Aristotle's definition of 'point'. It is only in this way that it is possible to explain how a magnitude is potentially infinitely divisible (because the division can virtually occur at any point in it) but, at the same time, it can never be actually infinitely divided (because the division at some point makes it impossible to further divide the magnitude at the points "immediately next" to them). A correct understanding of this passage is therefore fundamental for the definition of the property of 'infinite divisibility' as it applies to continuous entities: such property, while allowing for a (virtually) never-ending process of division of a given magnitude, can never bring to its annihilation, not even in an *infinite* time: what results from the process of division (be it physical, or merely conceptual) is always a (potentially divisible) magnitude, however small[120]. Yet, as subsequent chapters

[120] This is what Aristotle explicitly claims at 317a14-15. It is regrettable that WIELAND, *Die aristotelische Physik. Untersuchungen über die Grundlegung der Naturwissenschaft und die sprachlichen Bedingungen der Prinzipienforschung bei Aristoteles*, *op. cit*., does not take into account this chapter while discussing the notion of potential infinite divisibility entailed by Aristotle's notion of continuity, and, especially, the kind of potency associated with the infinite and, specifically, with the concept of infinite divisibility (but also, analogously, with that of infinite enumerability, or infinite addition, applying to entities such as numbers). Wieland bases his overall discussion mostly on *Metaphysics* Θ (for the various notions of potency distinguished by Aristotle) and on *Physics* III.4-8 (for the concept of the infinite itself). Indeed, the potency entailed by Aristotle's notion of the infinite, and specifically of infinite divisibility, is certainly a *sui generis* one, being a potency that cannot be actualised. Wieland, I believe rightly, understands Aristotle's notion of potential infinite divisibility as being a notion based on what he calls a "cinematic", as opposed to an "ontological", concept of potency, that is to say, a concept of potency that is not based on the idea that

of this thesis will make clear, the process of progressive division of a sensible magnitude, before reaching any theoretical limit, can reach a point at which it starts affecting its hylomorphic composition[121].

1.2.5. Arguments against Atomism in *De generatione et corruptione* I.8

After this analysis, it is now possible to turn to the other discussion that Aristotle instructs against the atomists, in *De generatione et corruptione* I.8. This chapter markedly differs from I.2, insofar as it is only here that Aristotle presents his own objections to the atomists' theories, defying them, in a sense, on their own ground, rather than simply

it can be brought to exist in act, but rather on the idea that it can suffer an activity (in this case, that of undergoing a process of division, which Wieland correctly interprets as being primarily a conceptual one), and that it can do so *ad infinitum*. Moreover, Wieland is certainly right in understanding such a concept as being intrinsically linked to the operation, i.e., the activity of dividing itself. Still, in Wieland's reconstruction what is still missing, or, at least, not clear enough, is the specific reason why the process of infinite division cannot come to an end. Indeed, it is only according to the conceptual model proposed by Aristotle in *De generatione* I.2, so I believe, that it is possible to fully make sense of this aspect. Indeed, according to what Aristotle says in this chapter, it is exactly the *partial* actualisation of the process that makes its complete actualisation (therefore the actualisation of the potency associated with an infinite, as opposed to a finite, division) impossible. By having divided a line at a certain point, it automatically becomes impossible to divide it at another point. Therefore, while the actualisation of an infinite process of division of a given magnitude (or of a given continuous entity more generally) evidently presupposes the actualisation of any finite process of division of the same magnitude (or entity), it is exactly the actualisation of such a finite process of division to make the corresponding actualisation of the infinite process of division impossible. This is why, as Wieland correctly remarks, the denial of the possibility to be actualised is an essential feature of the notion of potency contained in the concept of potential infinite divisibility.

[121] It is noteworthy that, in the closing of chapter I.2, Aristotle indeed refers to hylomorphic compounds: indeed, having shown that it is possible to consistently hold a doctrine of (sensible and mathematical) continua as entities which are infinitely divisible, he is in a position (at 317a17-23) to reject the idea that generation and corruption depend on the association and dissociation (or division) of indivisible entities (i.e., atoms) and to claim that a mere process of division can never bring about corruption (or a mere process of association can bring about generation), a claim that, be it said incidentally, will explicitly play a role in the Medieval Latin debate on *minima naturalia* (and, derivatively, also of *minima sensibilia*; see *infra*, Chapters 2 and 3 especially). As he claims: "In the object which is concerned by change, form and matter must be distinguished" (317a23-24). It is only by reference to both metaphysical parts of a hylomorphic compound that it is possible to explain its generation and corruption: considerations applying only to its matter, insofar as it is a magnitude, would not do. Of course, Aristotle then remarks that the association of hylomorphic compounds with the same substantial form, such as drops of water, can form a new entity, in a sense, namely a larger mass of water, but this is not a generation in the proper sense of the word, as it is proved by the fact that any "compound" of this sort is more easily destroyable than a single drop of water (cf. 317a27-29). All these considerations, which Aristotle does not develop further in the closing of this chapter (he rather announces that he will develop them further in what follows, with a likely reference to the discussion of mixture in chapter I.10, and especially 328a23-b22), will find important applications in the analysis of *minima* (cf. *infra* all the following chapters of the thesis).

defending his conception of continuity and (potential) infinite divisibility against their objections[122].

Here, of course, it is neither feasible nor even useful to go through all of them in detail, since this would imply a long and convoluted discussion which, although it would certainly be useful to a more correct understanding both of Aristotle's own thought and (although this has been contested in recent literature)[123] of the positions of the atomists themselves, would not add anything substantial to the understanding of Aristotle's notions of continuity and of (potential) infinite divisibility. What I purport to do, rather, is to discuss in some detail the main aspects of Aristotle's criticism, abstracting them from specific objections and presenting them together as part of a single over-arching argumentative strategy.

The proper subject of the chapter are the categories of action and passion, and, in this context, Aristotle refers to the relevant doctrines of Empedocles, the atomists and Plato. As in chapter I.2, the atomists are subjected to a much more favourable treatment than their counterparts by Aristotle[124], whose harsher criticisms are mostly addressed against Empedocles and, partially, Plato.

The peculiarity of the way in which atomism is introduced in chapter I.8 is the fact that Aristotle interprets the development of the atomistic theory, first by Leucippus and then, more completely, by Democritus, as an attempt to reconcile the Eleatic denial of the existence of multiplicity and change with the apparently contradictory evidence coming from everyday experience. It is of course a matter of debate (one which needs not

[122] Thus expanding on, and partially supplementing, the arguments against atomism presented in *Physics* VI, on which see section 1.2.3 above.

[123] The idea, in particular, that the positions presented by Aristotle as being those of Leucippus and Democritus truly reflect their views has been challenged in recent literature, but this has no bearing on the argumentation of this chapter and of the thesis more generally, and such a debate can therefore be disregarded here.

[124] In this sense, it is to be particularly remarked the fact that Aristotle reiterates his positive evaluation of the ontological parsimony (and the attention to perceptual evidence) of the atomists: "The most systematic theory, however, which covers all the phenomena with a single explanation, is that of Leucippus and Democritus, who adopt a principle which is in accordance with nature" (I.8, 324b35-325a2). ARISTOTELES, *De generatione et corruptione*, ed. JOACHIM: "ὁδῷ δὲ μάλιστα καὶ περὶ πάντων ἑνὶ λόγῳ διωρίκασι Λεύκιππος καὶ Δημόκριτος, ἀρχὴν ποιησάμενοι κατὰ φύσιν ἥπερ ἐστίν." Translatio vetus, ed. JUDYCKA, p. 40, ll. 5-8: "Via autem maxime et de omnibus uno sermone determinaverunt Leucippus et Democritus, principium facientes secundum naturam que est." Translatio Guillelmi, ed. JUDYCKA: "COMPENDIOSE autem maxime et de omnibus uno sermone determinaverunt Leucippus et Democritus, principium facientes secundum naturam quod est."

be discussed here) whether this connection is historically correct[125]. Be that as it may, in Aristotle's reconstruction atomism simply applies the character of the Eleatic One to atoms (to the effect that they are indivisible, indestructible, unmodifiable), while claiming that the latter are infinite in number and separated by the vacuum. In this way, multiplicity is introduced at the basic ontological level, namely, that of atoms, which are also thought to be invisible due to their smallness (although, and this is crucial, still having an extension), while change is allowed at the "macroscopic" (i.e., perceptual) level. At this level, indeed, what appears to be generation and corruption is the result of the association and dissociation of atoms, and all other kinds of change depend on change in the position, order, quantity and type of atoms in the entity affected by change.

It is only after having presented the atomists' doctrine in some detail that Aristotle starts addressing his criticisms at it. His general strategy is different from the one of *Physics* VI, which, as seen, is based on an analysis of the impossibilities that would follow from the assumption of the indivisibility of motion[126]. In *De generatione et corruptione*

[125] Traditionally, Aristotle has been taken as a reliable source in this respect. See, for instance, ARISTOTE, De la génération et de la corruption. *Texte établi et traduit*, C. MUGLER (ed., trans.), Paris, Les Belles Lettres, 1966, p. 86: "Ce texte d'Aristote, 324b35-325b5, est fondamental pour la connaissance du rapport de filiation entre l'école éléate et l'atomisme." A more balanced view, which takes the historical value of the passage as doubtful, and, in any case, ultimately impossible to assess, is H. CHERNISS, *Aristotle's Criticism of Presocratic Philosophy*, New York, NY, Octagon Books, 1935. Surprisingly, some scholars went as far as to claim that the passage is a fragment of the atomists' doctrine, and, more precisely, of Leucippus, who is quoted more frequently than Democritus in this section of *De generatione* I.8. The most "recent" attempt in this respect is represented by J. BOLLACK, *Deux figures principales de l'atomisme d'après Aristote: l'entrecroisement des atomes et la sphère de feu*, in I. DÜRING (ed.), *Naturphilosophie bei Aristoteles und Theophrast. Verhandlungen des 4. Symposium Aristotelicum veranstaltet in Göteborg. August 1966*, Heidelberg, Lothar Stiehm Verlag, 1969, pp. 32-50. This and previous attempts in this respect have been effectively refuted by H. DE LEY, "Aristotle, *De gen. Et corr.* A 8, 324b35-325b11: A Leucippean Fragment?", *Mnemosyne, Fourth Series* 25 (1), 1972, pp. 56-62. Given the traditional preponderance towards the acceptance of the historical value of the passage, it is all the more noteworthy that, in recent years, claims to the opposite have become increasingly prominent (and, in parallel, many recent commentators have also made the choice of refusing to address the issue at all: see, for instance, E. HUSSEY, On Generation and corruption *I.8*, in F.A.J. DE HAAS, J. MANSFELD (eds.), *Aristotle's* On Generation and Corruption *I*, *op. cit.*, pp. 243-265, pp. 255-256, who only mentions the issue in n. 25 and limits himself to remark that Aristotle asserts the historical correctness of his account here with much more conviction than he does in *De generatione* I.2, 316a13, with regard to Democritus). In particular, the opinion that the link between atomism and Eleatism is only a logical device established by Aristotle for expository and argumentative reasons, deprived of a historical basis, has gained significant ground. Some scholars, such as Laura Gemelli, even went so far as to claim that Aristotle thinks here of atomism in the context of how it was treated and discussed in Plato's academy in his own time: see especially M.L. GEMELLI MARCIANO, *Democrito e l'Accademia/Democritus and the Akademeia. Studi sulla trasmissione dell'atomismo antico da Aristotele a Simplicio (Studia Praesocratica 1)*, Berlin, de Gruyter, 2007.

[126] Although this should not be taken to imply that Aristotle does not draw on arguments and observations from *Physics* VI (and *Physics* VIII) in his criticism of atomism in this chapter. For more details, see HUSSEY, On Generation and Corruption *I.8*, *op. cit.*, which also notes that, instead, the arguments in this chapter, focusing on the more "concrete" questions related to the continuity and divisibility of magnitude,

I.8, Aristotle focuses more exclusively on the issue of the existence of indivisible magnitudes, and he tries to show all the absurdities that follow from the arbitrary (according to Aristotle) separation between the level of atomic magnitudes and that of "macroscopic" (i.e., sensible) ones[127]. To put it in other words, Aristotle's main charge against the atomists is that they assume, without justification, that some magnitudes (namely, atoms) are ontologically prior and fundamentally different from all other magnitudes. His strategy to refute atomism, therefore, consists in showing that, since atoms, even on Leucippus' and Democritus' count, do possess some of the properties also shared by "macroscopic" (i.e., sensible) magnitudes, they must also possess all the others and, consequently, they must be treated as all the other magnitudes and be subjected to change and, especially, division.

The passage in which the core of Aristotle's argumentative strategy comes more clearly to light (and the most important one for the purposes of this thesis, since it directly addresses the issue of the divisibility of magnitudes) is the following one:

> Again, it is absurd too that small things should be indivisible but not big things. As it is, there is good reason why larger things should be broken up rather than small things; for the former – the large things, that is – disintegrate easily because they hit a great number of things; but why should total indivisibility belong to small things rather than to big things?[128].

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rather than the more "abstract" ones related to the continuity and divisibility of motion and time, have a much closer affinity with the criticisms to atomism presented by Aristotle in *De caelo* III and IV, ones which, unfortunately, there is no space to examine here.

[127] To be precise, Aristotle divides the criticisms in two broad kinds: the former (which corresponds to the first part of the text, 325b36-326a29) is the one just mentioned. After having discussed the absurdities which follow from the distinction between atomic and "macroscopic" magnitudes, however, Aristotle discusses some more general problems concerning atomism, notably, the problem of the numerical distinctness of atoms, given their common nature, once they come together (326a29-b2) and the problem of the source of the atoms' motion (326b2-6). Here I consider only the former kind of arguments, being the ones conceptually closer to the problem of the divisibility of magnitudes.

[128] ARISTOTELES, *De generatione et corruptione* I.8, 326a24-29, ed. JOACHIM: "Ἔτι δ᾽ἄτοπον καὶ τὸ μικρὰ μὲν ἀδιαίρετα εἶναι, μεγάλα δὲ μη. Νῦν μὲν γὰρ εὐλόγως τὰ μείζω θραύεται μᾶλλον τῶν μικρῶν· τὰ μὲν γὰρ διαλύεται ῥᾳδίως, οἷον τὰ μεγάλα, προσκόπτει γὰρ πολλοῖς, τὸ δὲ ἀδιαίρετον ὅλως διὰ τί μᾶλλον ὑπάρχει τῶν μεγάλων τοῖς μικροῖς;" Translatio vetus, ed. JUDYCKA, p. 44, ll. 4-8: "Amplius autem inconveniens et parva quidem indivisibilia esse, magna autem non. Nunc quidem enim magis rationabiliter maiora confringuntur quam parva. Hec quidem enim dissolvuntur facilius parvis, verbi gratia magna, procedunt enim multis. Indivisibile autem universaliter quare magis quam magnis existit parvis?" Translatio Guillelmi, ed. JUDYCKA: "Amplius autem inconveniens et parva quidem indivisibilia esse, magna autem non. Nunc quidem enim rationabiliter maiora magis confringuntur quam parva. Hec quidem enim dissolvuntur facilius*, verbi gratia magna, OFFENDUNT enim multis. Indivisibile autem universaliter quare magis quam magnis existit parvis?" It is to be remarked that HUSSEY, On Generation and Corruption *I.8, op. cit.*, p. 259, takes this argument to belong to the latter kind of arguments introduced by Aristotle against atomism in this chapter, thus being a "general" issue unrelated to the more specific concerns of the previous section. I do not see how this is possible, since it is rather evident from its position

This passage completes the (admittedly brief) examination of Aristotle's main arguments in favour of the continuity and (potential) infinite divisibility of magnitudes and against the existence of indivisible magnitudes. In the next sections of the chapter I will explore the ways in which these passages, read as individual arguments or as interconnected elements, have been interpreted by Late Ancient and by Averroes and, finally, how they have affected Medieval Latin commentators, thus founding their common belief in the continuity of magnitudes and in their (potential) infinite divisibility. In so doing, I will especially focus on three issues, which I deem to be particularly fundamental in this respect: the first is the commentators' understanding of Aristotle's definition of continuity, the second is the way in which they interpreted the relation between continuity and (potential) infinite divisibility, and the third is whether, and in what sense, they individuated limits applying specifically to the (potential) infinite divisibility of material (and sensible) magnitudes.

1.3. The Continuity of Magnitudes in Late Ancient Aristotelian Commentators

The vicissitudes of Aristotle's doctrine of the continuity of magnitudes in the Late Ancient commentary tradition would certainly deserve a separate study. Nevertheless, some aspects of it must be certainly underlined here, especially in view of a comparison with the Medieval reception of such a doctrine[129].

in the chapter, and also from its formulation, that Aristotle is here pursuing (and culminating) his more specific strategy of attack against atomism in the chapter, namely, underlining the very absurdity that lies in considering atomic magnitudes indivisible but "macroscopic" ones not, the same exact strategy followed by all the previous arguments in the chapter, which all rely, more or less explicitly, on the assumption that attributing a property of whatever kind to some magnitudes (namely, atomic ones) but not to others is inherently absurd.

[129] Note that, for reasons of space (and also for the sake of clarity) my general methodological principle in the thesis, while dealing with the Late Ancient (and Islamic) Aristotelian commentators' texts, is not to provide a full reading and commentary of the passages corresponding to the explanation and discussion of the Aristotelian texts I take into account (something which would be extremely cumbersome and not necessarily informative), but, rather, to focus on some aspects of these passages which, for historical or theoretical reasons, are particularly significant. Unfortunately, as of today, a comprehensive study of the understanding of continuity among Late Ancient Aristotelian commentators is, to my knowledge, still lacking. Needless to say, such a work represents an important *desideratum* of research.

1.3.1. Late Ancient Commentaries on the *Categories*

A first study must certainly be conducted, accordingly with what has been done in the previous section regarding Aristotle's own texts, concerning Late Ancient commentaries on the *Categories* and on the *Metaphysics*. A study of commentaries on the *Categories* is especially relevant here, for two reasons[130]. First, already in Late

[130] A significant selection of Late Ancient commentaries on the *Categories* is extant. The most important one in terms of influence, for obvious reasons, is the one by Porphyry, whose Greek text has been published in the *Commentaria in Aristotelem Graeca* series as PORPHYRIUS, *Porphyrii Isagoge et in Aristotelis Categorias commentarium (Commentaria in Aristotelem Graeca IV, Pars I)*, ed. A. BUSSE, Berlin, Reimer, 1887. An English translation has been published in the *Ancient Commentators on Aristotle* series as PORPHYRY, *On Aristotle* Categories, S. STRANGE (trans.), London, Duckworth, 1992 (note that also a French translation with commentary and an amended Greek text, with respect to Busse's edition, has recently been published: PORPHYRE, *Commentaire aux Catégories d'Aristote, introduit, édité et traduit par* R. BODÉÜS, Paris, Vrin, 2008). We know that Porphyry also composed a longer commentary on the *Categories*, usually referred to as *Ad Gedalium*, from the name of the addressee (presumably a student of Porhryry). The commentary is extant only in fragments, quoted in Dexippus' and Simplicius's commentaries on the *Categories*. The Greek text of the fragments has been edited in PORPHYRIUS, *Porphyrii Philosophi fragmenta (Bibliotheca scriptorium Graecorum et Romanorum Teubneriana)*, ed. A. SMITH, fragmenta arabica D. WASSERSTEIN interpretante, Leipzig, Teubner, 1993 (reprint Berlin, de Grutyer, 2010). The fragments have received a French translation and a commentary in Michale Chase's Ph.D. thesis: M. CHASE, *Études sur le commentaire de Porphyre aux* Catégories *d'Aristote, adressé à Gédalios*, Ph.D. thesis, Paris, École Pratique des Hautes Études, 2000 (for a short presentation of the contents of the thesis see M. CHASE, "Études sur le commentaire de Porphyre aux *Catégories* d'Aristote, adressé à Gédalios", *Annuaires de l'École Pratique des Hautes Études* 108, 1999, pp. 505-510). Although some of the fragments refer to issues discussed in chapter 6 of the *Categories*, they do not have a significant bearing on the topics of the chapter, so I leave them out of consideration. Nevertheless, it should be remarked that in fragments 63-65 especially Porphyry addresses the differences between Aristotle's interpretation of some aspects of continuity and those of Greek geometry and of the Pythagorean tradition, defending Aristotle against deviant interpretations. This is in itself a very interesting consideration, showing that already since Porphyry Aristotelian commentators had started to take into account the geometrical tradition while discussing Aristotle's notion of continuity. In the last years, it has also been argued that a significant portion of the commentary, in a copy dating around 900 AD, is preserved in a palimpsest (the so-called 'Archimedes palimpsest') that has been recently discovered (cf. R. CHIARADONNA, M. RASHED, D. SEDLEY, N. TCHERNETSKA, *A Rediscovered* Categories *Commentary*, in B. INWOOD (ed.), *Oxford Studies in Ancient Philosophy 44*, Oxford, Oxford University Press, 2013, pp. 129-194, which also contains the preliminary edition of the text). The portion of the commentary preserved in the palimpsest, however, does not cover *Categories* 6, dealing exclusively with *Categories* 1a20-b15 and 1b16-24. On the contents of this portion of the commentary, which includes substantial references to earlier, lost commentaries on the *Categories* (those by Andronicus, Boethus, Nicostratus and Herminus, together with others by anonymous commentators), see also R. CHIARADONNA, M. RASHED, D. SEDLEY, *A Rediscovered* Categories *Commentary: Porphyry (?) with Fragments of Boethus*, in R.R.K. SORABJI (ed.), *Aristotle Re-Interpreted: New Findings on Seven Hundred Years of the Ancient Commentators*, London, Bloomsbury Academic, 2016, pp. 231-262. Another commentary is the one by Dexippus, a student of Iamblichus. The Greek text has been published in the *Commentaria in Aristotelem Graeca* series as DEXIPPUS, *Dexippi in Aristotelis Categorias commentarium (Commentaria in Aristotelem Graeca IV Pars II)*, ed. A. BUSSE, Berlin, Reimer, 1888. An English translation has been published in the *Ancient Commentators on Aristotle* series as DEXIPPUS, *On Aristotle* Categories, J. DILLON (trans.), London, Duckworth, 1990. A further commentary is the one based on the lectures by Ammonius, Philoponus' teacher in Alexandria, whose Greek text has been published in the *Commentaria in Aristotelem Graeca* series as AMMONIUS, *Ammonii in Aristotelis Categorias commentarium (Commentaria in Aristotelem Graeca IV, Pars IV)*, ed. A. BUSSE, Berlin, Reimer, 1895. An English translation has been published in the *Ancient Commentators on Aristotle* series

Antiquity, following Andronicus of Rhodes' ordering of the Aristotelian *corpus*, this work started to exercise its traditional role as the main introduction to the whole Aristotelian *corpus*, also in the context of Neoplatonic schools in which most of the extant commentaries find their origin. Second, and connectedly, as seen above Aristotle defines

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as AMMONIUS, *On Aristotle* Categories, G. MATTHEWS, M. COHEN (trans.), London, Duckworth, 1991. Another fundamental commentary is the one by Philoponus, whose Greek text has been published in the *Commentaria in Aristotelem Graeca* series as PHILOPONUS, *Philoponi (olim Ammonii) in Aristotelis Categorias commentarium (Commentaria in Aristotelem Graeca XIII, pars I)*, ed. A. BUSSE, Berlin, Reimer, 1898. An English translation has been published in the *Ancient Commentators on Aristotle* series in two volumes: PHILOPONUS, *On Aristotle* Categories *1-5*, R. SIRKEL, M. TWEEDALE, J. HARRIS (trans.), with PHILOPONUS, *A Treatise Concerning the Whole and the Parts*, D. KING (trans.), London, Bloomsbury, 2015; PHILOPONUS, *On Aristotle* Categories *6-15*, M. SHARE (trans.), London, Bloomsbury, 2019. The (chronologically) last fundamental Late Ancient commentary on the *Categories* is Simplicius', whose Greek text has been published in the *Commentaria in Aristotelem Graeca* series as SIMPLICIUS, *Simplicii in Aristotelis categorias commentarium (Commentaria in Aristotelem Graeca VIII)*, ed. C. KALBFLEISCH, Berlin, Reimer, 1907. An English translation has appeared in the *Ancient Commentators on Aristotle* series in four volumes: SIMPLICIUS, *On Aristotle* Categories *1-4*, M. CHASE (trans.), London, Duckworth, 2003; SIMPLICIUS, *On Aristotle* Categories *5-6*, F. DE HAAS, B. FLEET (trans.), London, Duckworth, 2001; SIMPLICIUS, *On Aristotle* Categories *7-8*, B. FLEET (trans.), London, Duckworth, 2002, and SIMPLICIUS, *On Aristotle* Categories *9-15*, R. GASKIN (trans.), London, Duckworth, 2000. The importance of Simplicius' commentary on the *Categories* lies also in the fact that it was translated in Latin by William of Moerbeke already in March of 1266, and, as a consequence, started to exert a decisive influence on later Medieval commentators, at least since Thomas Aquinas himself (I will point below to specific elements of influence on subsequent Latin commentators on the *Categories* that I discuss in this chapter). For a detailed analysis of the influence of the Latin translation of Simplicius' commentary in the Latin Middle Ages, see at least A. PATTIN, *Pour l'histoire du* Commentaire sur les *Catégories* d'Aristote *de Simplicius au moyen âge*, in *Arts libéraux et philosophie au Moyen Age: IV^e Congrès international de philosophie médiévale, (Université de Montréal, 27 août-2 sept. 1967)*, Montréal-Paris, Institut d'Études Médiévales-Vrin, 1969, pp. 1073-1078. The Latin translation has been critically edited in two volumes as SIMPLICIUS, *Commentaire sur les Catégories d'Aristote. Traduction de Guillaume de Moerbeke. Édition critique. Tome I (Corpus Latinum Commentariorum in Aristotelem Graecorum 5.1)*, par A. PATTIN, en collaboration avec W. STUYVEN, Louvain-Paris, Publications Universitaires-Béatrice Nauwelaerts, 1971, and SIMPLICIUS, *Commentaire sur les Catégories d'Aristote. Traduction de Guillaume de Moerbeke. Édition critique. Tome II (Corpus Latinum Commentariorum in Aristotelem Graecorum 5.2)*, par A. PATTIN, en collaboration avec W. STUYVEN et C. STEEL, Leiden, Brill, 1975. The Latin translation of the commentary on *Categories* 6 is part of the first volume of the critical edition of the translation, from which I will quote in what follows. Other extant commentaries (of which no modern translation has appeared to date) included in the *Commentaria in Aristotelem Graeca* series are those by Olympiodorus (a 6th-century Neoplatonic philosopher from the school of Ammonius in Alexandria) and one of his pupils, Elias (according to the traditional identification), and an anonymous one which was to circulate in the Latin Middle Ages as the *Paraphrasis Themistiana* (cf. *supra* in the previous section): OLYMPIODORUS, *Olympiodori Prolegomena et in Aristotelis Categorias commentarium (Commentaria in Aristotelem Graeca XII, Pars I)*, ed. A. BUSSE, Berlin, Reimer, 1898; ELIAS, *Eliae in Porphyrii Isagogem et Aristotelis Categorias commentaria (Commentaria in Aristotelem Graeca XVIII, Pars I)*, ed. A. BUSSE, Berlin, Reimer, 1900; ANONYMUS, *Anonymi in Aristotelis Categorias paraphrasis (Commentaria in Aristotelem Graeca XXIII, Pars II)*, ed. M. HAYDUCK, Berlin, Reimer, 1883. To all these, of course, it should also be added Boethius' commentary on the *Categories*, the only one which kept a constant presence in the Latin Middle Ages. The standard edition is the one included in Migne's *Patrologia Latina*, from which I will quote in what follows (BOETHIUS, *In Aristotelis Categorias*, in *Patrologiae cursus completus, series latina, Vol. LXIV*, ed. J.-P. MIGNE, Paris, Garnier, 1891 [1847]). However, a new critical edition is in (an advanced stage of) preparation by Monika Asztalos (for information on the edition, see for instance M. ASZTALOS, "Boethius as a Transmitter of Greek Logic to the Latin West: The *Categories*", *Harvard Studies in Classical Philology* 95, 1993, pp. 367-407).

continuity only in an abridged way in *Categories* 6, and, what is more, without linking it with the notion of (potential) infinite divisibility. It is therefore noteworthy that, as it will now be shown, contrary to Aristotle Late Ancient commentators on the *Categories* understood the definition of continuity, as two entities joining at a common boundary, in terms of the possibility of dividing them at that boundary. This interpretation betrays an understanding of the notion of continuity which aimed at providing a unified view of the notion considering the whole Aristotelian *corpus*. This becomes particularly evident in Simplicius (and in Boethius), but it seems to be, at least to a certain degree, a common aim of Late Ancient commentators. Moreover, it seems evident from their commentaries that many of them based their reading of *Categories* 6 on *Metaphysics* Δ.13, frequently in an implicit way, but (at least in one case), also explicitly, therefore interpreting 'continuous' quantities as 'magnitudes' which are potentially infinitely divisible and 'discrete' quantities as 'pluralities' which are only finitely divisible[131]. Therefore, in so doing, Late Ancient commentators reinforced their account of the notion of continuity as immediately implying that of (potential) infinite divisibility. In this way, they laid the ground for a process which, in the subsequent Aristotelian tradition, will inextricably link the two concepts, in a way which probably went beyond what Aristotle himself would have subscribed to.

1.3.1.1. Porphyry

The most ancient extant commentary on the *Categories* is the question-and-answer commentary by Porphyry (ca. 234 AD- ca. 305 AD), structured as a dialogue between a teacher and a student. Porphyry devotes an important section of the commentary to the discussion of discrete and continuous quantities. His general explanatory strategy is that of first defining discrete quantities, and then interpreting continuous ones as those opposed to them (cf. especially 102.11-12). Therefore, he first defines continuous quantities as those which move together whenever a part of them is moved, contrary to what happens with discrete quantities (cf. 102.12-20)[132]. It is at this point, however, that

[131] The key passage in this respect is *Metaphysics* Δ.13, 1020a7-14.
[132] This is reminiscent of Aristotle's remarks in the *Metaphysics* Δ.6, 1015b36-1016a17, regarding continuity and motion. See above, in previous section, and also below, in this section, Boethius' own commentary on the *Categories*.

the most interesting remark concerning continuous quantities arises. The student, indeed, asks the teacher to provide a further example of continuous quantity, apart from that of line, which was the one discussed up to that point. Porphyry replies by quoting surface, which is the next item, as seen, in the list of continuous quantities given by Aristotle in *Categories* 6. The student therefore asks why surface is considered a continuous quantity, and the teacher gives the following reply:

> Because a surface is divided by a line, and insofar as it is so divided, when the line is present in the division, the line considered in this way, as if projected upon the surface, becomes a common boundary at which the parts of the surface are joined to one another. If you were to imagine this line as itself coming to be in actuality between the parts of the surface, it would divide the whole. But if it does not divide the whole, it will be conceived as the limit of one part of the surface and as the origin of the other part, and it will be the shared boundary of the two parts, and will in virtue of itself connect these parts with one another[133].

What is fundamental in the passage is the fact that the common boundary which defines surface as a continuous quantity, namely, line, is interpreted *e contrario* as what divides a continuous quantity (in this case a surface) in two parts, so that continuity comes to imply (potential) divisibility according to the common boundary of the quantity itself, which comes into existence by actual division. Of course, the (potential) divisibility implied in this context is an *infinite* one, although Porphyry does not claim it explicitly.

1.3.1.2. Dexippus

This kind of interpretation will find important confirmations in later commentaries on *Categories* 6. One has only to turn, for instance, to that of Dexippus, a student (or follower) of Iamblichus who probably lived in the early decades of the 4th century AD. Dexippus, discussing quantity at the beginning of Book 3 of his question-and-answer commentary (as it was Porphyry's one), builds division into the very criterion which

[133] PORPHYRY, *On Aristotle* Categories, STRANGE (trans.), *op. cit.*, pp. 97-98. For the Greek text see PORPHYRIUS, *Porphyrii Isagoge et in Aristotelis Categorias commentarium*, ed. BUSSE, *op. cit.*, 102.26-34: "Ὅτι τέμνεται μὲν ἡ ἐπιφάνεια γραμμῇ, καθὸ δὲ τέμνεται, ὅταν ἐκείνη τῇ τομῇ προσῇ, χοινὸς ὅρος γίνεται ἡ ἐπινοουμένη γραμμή, ὥσπερ ἡ ἐπικειμένη ἄνωθεν, καθ᾽ ἣν συνάπτεται ἀλλήλοις τὰ μέρη τῆς ἐπιφανείας, ταύτην δὲ τὴν γραμμὴν εἰ ἐπινοήσειας ἐνεργείᾳ γινομένην καθ᾽ἑαυτὴν μεταξὺ τῶν μερῶν, τέμνοι ἂν τὸ ὅλον· ἐὰν δὲ οὐ τέμνῃ, τοῦ μὲν ὥσπερ πέρας θεωρουμένη πέρας μέρους τοῦ δὲ ὡς ἀρχὴ χοινωωοῦσα ἀμφοῖν ὅρος τοῖν μεροῖν συνάπτοι ἂν ταῦτα πρὸς ἄλληλα δι᾽ἑαυτῆς."

ultimately allows one to distinguish between discrete and continuous quantities. Dexippus first makes use of the distinctions established by Aristotle in *Metaphysics* Δ, claiming that the continuous is better called (unified) magnitude, and the discrete multiplicity (cf. 66,26-28). He then goes on to remark the following:

> […] in the case of the unified [i.e., the continuous] there is division to infinity from the totality, and increase to a limited extent, while in the case of the multiplicity by contrast there is increase *ad infinitum*, and, conversely, division to a limited extent […][134].

The passage could not be more remarkable: Dexippus understands discrete quantities, such as (natural) numbers, to be only finitely divisible, while infinite insofar as they are an open-ended ordered series, while continuous quantities, such as three-dimensional bodies, can be divided to infinity but have clear limits to their size (the upper limit being, evidently, the dimension of the cosmos, whose size is discussed by Dexippus a few lines before the quoted passage (cf. 66.28-31). In this way, continuous quantities come to be associated with the infinite by division, whereas discrete ones with the infinite by addition.

1.3.1.3. Ammonius

The fact that this line of interpretation (linking in an increasingly stronger way continuity and potential infinite divisibility) became the one more prominent in the Late Ancient commentary tradition on *Categories* 6 is attested by two later commentaries on the same work. One is that based on the lectures of Ammonius (ca. 435/445 AD-517/526 AD), Philoponus' teacher in Alexandria, while the other is that by Simplicius.

Ammonius, providing a line-by-line interpretation of the Aristotelian text is, admittedly, less able to develop the connection between continuity and (potential) infinite divisibility. Yet, when commenting on *Categories* 6, 5a1, where Aristotle defines a line as a (kind of) continuous quantity, he remarks the following:

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[134] DEXIPPUS, *On Aristotle* Categories, DILLON (trans.), *op. cit.*, Book III, p. 115. For the Greek text see DEXIPPUS, *Dexippi in Aristotelis Categorias commentarium*, ed. BUSSE, 66.32-67.1: "[...] τοῦ μὲν ἠνωμένου ἐπ᾽ἄπειρον ἐκ παντός ἐστιν ἡ τομή, ἡ δὲ αὔξησις ἐπὶ ὡρισμένον, τοῦ δὲ πλήθους κατὰ ἀντιπεπόθησιν ἐπ᾽ἄπειρον μ῀εν ἡ αὔξησις, ἔμπαλιν δὲ ἡ τομὴ ἐπὶ ὡρισμένον [...]."

> This is reasonable, for each part of it meets another at a common boundary, a point. But one should take the division <as> in the mind and not in actuality, since <actually> dividing it would not allow it to be continuous[135].

In Ammonius' interpretation, therefore, not only the common boundary which defines continuous quantities is interpreted as being the point of (potential) division of them, but, moreover, the actual division at such a point determines the coming into being of two quantities which are discrete one with respect to the other, while, of course, both remaining in themselves continuous. The implication of Ammonius' view, therefore, seems to be that while continuous quantities are characterised by the fact that they are divisible, discrete ones can rather be characterised by the fact that they are *the result of* a division. In this way, divisibility not only comes to characterise continuous quantities, but even the very distinction between continuous and discrete ones.

1.3.1.4. Simplicius

A more expanded interpretation along the same lines can be found by looking at Simplicius' (ca. 480 AD – 560 AD) commentary on *Categories* 6, where, in the context of explaining how points, lines and bodies can all be said to be continuous, Simplicius inserts the following considerations:

> But how is it that the line when divided still has the point as the common boundary, while the surface when divided has as its common boundary the line, or the body the surface? For when things are divided they no longer have a common boundary at which their parts join together, since they are circumscribed by their own limits and have their own boundaries. The answer is that one should consider the division in terms of potentiality, and not in actuality, and in potentiality the point is what is common in the line, the line in the surface, and the surface in the body – if the common limit is to be one, which must be the case for the continuous. For then these are taken in actuality and become two, if they are adjacent, they bring their limits together and cause the things that are delimited to be touching; otherwise they cannot be touching[136].

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[135] AMMONIUS, *On Aristotle* Categories, MATTHEWS, COHEN (trans.), *op. cit.*, p. 68. For the Greek text see AMMONIUS, *Ammonii in Aristotelis Categorias commentarium*, ed. BUSSE, 57.26-58.2: "Εἰκότως· ἕκαστον γὰρ αὐτῆς μόριον συνάπτει πρὸς ἄλλο κοινῷ ὅρῳ τῷ σημείῳ. δεῖ δὲ λαβεῖν τὴν διαίρεσιν νῷ καὶ μὴ ἐνεργείᾳ, ἐπεὶ διαιρήσις αὐτὴν καὶ οὐκ ἐάσεις εἶναι συνεχῆ."

[136] SIMPLICIUS, *On Aristotle* Categories *5-6*, DE HAAS, FLEET (trans.), *op. cit.*, p. 103. For the Greek text see SIMPLICIUS, *Simplicii in Aristotelis categorias commentarium*, ed. KALBLFLEISCH, *op. cit.*, 125.3-12:

Continuity is, according to Simplicius, best described by (potential) infinite divisibility, in a way which puts together in a unified way the suggestions and remarks present in his predecessors' commentaries (as it is usually the case in Simplicius' commentaries). Nevertheless, Simplicius does not only provide a summary of the exegetical tradition on *Categories* 6 up to his time, rather, he also inserts important elements of originality in his commentary. One of them (one which, interestingly, will find its counterpart in Philoponus' commentary on *De generatione* I.8) is particularly relevant to this thesis. In arguing, indeed, for the traditional Neoplatonic issue as to whether discrete quantities are (logically and ontologically) prior to continuous ones, he not only understands the quantities resulting from the division of continuous ones as discrete one with respect to the other (with the same implications of Ammonius' analogous view), but he also remarks the following:

> In reply to this it seems incontrovertible to argue that the discrete is not by nature prior, since the discrete has its being from the division of the continuous, and certain continuous things, like atoms (ὡς αἱ ἄτομοι), are indivisible[137].

"Ἀλλὰ πῶς ἡ διαιρεθεῖσα γραμμὴ ἔτι κοινὸν ὅρον ἔχει τὸ σημεῖον, ἡ δὲ διαιρεθεὶσα ἐπιφάνεια κοινὸν ὅρον ἔχει τὴν γραμμὴν ἢ τὸ σῶμα τὴν ἐπιφάνειαν; τὰ γὰρ διαιρεθέντα οἰκείοις πέρασιν περιγραφόμενα καὶ οἰκείους ἔχοντα ὅρους οὐκέτι κοινὸν ὅρον ἔχει, πρὸς ὃν συνάπτει τὰ μόρια αὐτῶν. ἢ δυνάμει δεῖ θεωρεῖν τὴν διαίρεσιν, ἀλλ᾽οὐκ ἐνεργείᾳ, καὶ δυνάμει ἐν μὲν τῇ γραμμῇ τὸ κοινὸν σημεῖον, ἐν δὲ τῇ ἐπιφανείᾳ τῆν γραμμήν, ἐν δὲ τῷ σώματι τὴν ἐπιφάνειαν, εἰ μέλλοι ἓν εἶναι τὸ ἀμφοῖν πέρας, ὅπερ δεῖ προσεῖναι τῷ συνεχεῖ· ἐνεργείᾳ γὰρ ληφθέντα ταῦτα καὶ δύο γενόμενα, εἰ μὲν παρακείμενα εἴη, ἅμα ποιεῖ τὰ πέρατα καὶ ἁπτόμενα τὰ πεπερατωμένα, εἰ δὲ μή, οὐδὲ ἁπτόμενα δύναται εἶναι." For Moerbeke's Latin translation, see SIMPLICIUS, *Commentaire sur les Catégories d'Aristote. Traduction de Guillaume de Moerbeke. Édition critique. Tome I*, par PATTIN, en collaboration avec STUYVEN, p. 169, l. 86-p. 170, l. 96: "Sed quomodo divisa linea adhuc communem terminum habet punctum, et divisa superficies communem terminum habet lineam aut corpus superficiem? Divisa enim propriis terminis circumscripta et proprios terminos habentia non adhuc communem terminum habent, ad quem copulentur partes ipsorum. Aut potentia oportet considerare divisionem, sed non actu, et potentia in linea quidem commune punctum, in superficie autem lineam, in corpore autem superficiem, si debeat unus esse amborum terminus, quod oportet inesse continuo; actu enim accepta haec et duo facta, siquidem secus invicem posita sint, simul faciunt terminos et tangentia terminata, si autem non, neque tangentia possunt esse."

[137] SIMPLICIUS, *On Aristotle* Categories *5-6*, F. DE HAAS, FLEET (trans.), *op. cit.*, p. 105. For the Greek text see SIMPLICIUS, *Simplicii in Aristotelis categorias commentarium*, ed. KALBLFLEISCH, *op. cit.*, 126.28-30: "πρὸς δὴ ταῦτα τὸ μὲν φιλονεικεῖν ὡς οὐκ ἔστιν φύσει πρότερον τὸ διωρισμένον, διότι ἀπὸ τῆς τοῦ συνεχοῦς διαιρέσεως τὸ εἶναι ἔχει τὸ διωρισμένον, καὶ ἔστιν τινὰ συνεχῆ ἀδιαίρετα, ὡς αἱ ἄτομοι, βίαιον δοκεῖ." For Moerbeke's Latin translation, see SIMPLICIUS, *Commentaire sur les Catégories d'Aristote. Traduction de Guillaume de Moerbeke. Édition critique. Tome I*, par PATTIN, en collaboration avec STUYVEN, p. 171, ll. 52-55: "Ad haec igitur contendere quod non sit natura prius distinctum, quia ex continui divisione esse habet discretum, et sunt quaedam continua indivisibilia, sicut atomi, extorsio videtur."

Now, the element which immediately jumps to the eye in this passage is the *nonchalance* with which Simplicius introduces the (apparently oxymoronic) notion of 'continuous atoms'. What does he mean by this? The answer, as will be suggested later in this section by a comparison with a relevant passage from Philoponus's commentary on *De generatione* I.8, lies in the fact that the (potential) infinite divisibility of continuous quantities can never be fully actualised (neither in "physical" reality nor by a mere conceptual process of division[138]), according to the fundamental Aristotelian denial of the existence of the actual infinite. Due to the natural limits of the dividing agent (but also due to the conceptual limits to the process of division of magnitudes, as seen in the analysis of *De generatione* I.2), a continuous quantity can never be infinitely divided, so that, at the end of the division, there remains something which, while being in itself continuous and therefore further divisible, is, nevertheless, the smallest quantity that can be achieved by a specific process of division, and, as such, an "atom" (or, it should better be said, a *minimum*). Nevertheless, it is important to remark that in this context Simplicius is not talking of what in the following chapters will be identified as an Aristotelian *minimum*, i.e., a hylomorphic *minimum*: the two issues are fundamentally different. Here Simplicius is only discussing the continuity of magnitudes, without any reference to hylomorphism. Hylomorphic *minima*, instead (both *naturalia* and *sensibilia*) depend on the persistence of the substantial and, respectively, accidental forms of a given substance in particularly small portions of the same substance.

1.3.1.5. Boethius

A final confirmation of the interpretative trends discussed is to be found in Boethius' (ca. 475/477 AD- ca. 526 AD) commentary on *Categories* 6, the only extant Latin Late Ancient commentary on the *Categories* and the only one which accompanied the Latin translation of the Aristotelian work in the Medieval Latin tradition (at least until the translation of Simplicius' commentary by William of Moerbeke in 1266). After introducing the traditional definition of continuity, Boethius remarks:

[138] Note that the passage from Philoponus' commentary on *De generatione* I.8 only focuses on the physical limits to the divisibility of magnitudes, differently from Simplicius' passage at stake.

> Continuous quantities, moreover, are those (as it has been said) in whose parts there is a certain common extremity, such as a line. If someone, indeed, divides a line, which is length without breadth, it produces two lines in both divisions, and the single points of both lines return to exist in the extremities due to the division. Indeed, the extremities of a line are points. For this reason, when that line is not divided, both points which appear at the head of both line after the division, are conceived as being together before, [those points] which are separated in the division[139].

In the passage, not only the definition of continuity is understood in terms of divisibility, but, more precisely, in terms of (potential) infinite divisibility. Boethius goes on to remark that the same considerations which hold for lines also hold for surfaces and bodies. Boethius does not, however, introduce any of the more original remarks of Greek commentators (such as the idea that the two quantities resulting from the division of a continuous quantity are discrete with respect one to the other, or the reference to limits to the divisibility of continuous quantities). Nevertheless, Boethius does makes reference, a few lines after the passage quoted, to the fact that continuity is also identified by the fact that a continuous entity moves in a unitary way (so that when one part of it moves, all the others do)[140]. This criterion is clearly reminiscent of Aristotle's remarks in *Metaphysics* Δ.6, 1015b36-1016a17, a passage which has been discussed in the previous section. Its mention in this context is probably dependent on Porphyry's discussion (mentioned above) of the same aspect in his commentary upon *Categories* 6. Nevertheless, the fact that Boethius feels the need to insert it in his commentary on *Categories* 6 bears witness to his own willingness to provide a unitary characterisation of the notion of continuity.

[139] For the Latin text see BOETHIUS, *In Aristotelis Categorias*, Liber II, ed. MIGNE, col. 204: "Continuae autem quantitates sunt (ut dictum est) in quarum partibus quidam communis est terminus, ut linea. Si quis enim dividat lineam, quae est longitudo sine latitudine, duas in utraque divisione lineas facit, et utriusque ex divisione lineae singula in extremitatibus puncta redduntur. Lineae enim termini puncta sunt. Quocirca cum illa linea divisa non esset, utraque puncta quae in utrisque linearum capitibus post divisionem apparent, simul antea fuisse intelliguntur, quae sunt in divisione separata."

[140] BOETHIUS, *In Aristotelis Categorias*, Liber II, ed. MIGNE, col. 204: "Est autem signum continui corporis, si una pars mota sit, totum corpus moveri; et si totum corpus movetur, certe simul aliae partes vicinae movebuntur, ut si jaceat virgula vel ex aere, vel ex ligno, vel ex quolibet alio metallo, si quis unum ejus caput vel quamlibet ejus partem moveat, tota mox virgula commovetur." Here it must be remarked that, although Boethius takes unity of motion as a criterion (*signum*) of the continuity of a given entity, he does not claim that this is the definition of the property of continuity itself. On the contrary, he explicitly links this aspect with the traditional definition of continuity, and makes it dependent upon it: "Hoc autem idcirco evenit quod ejus partes quodam communi termino conjunguntur, et ille communis terminus una parte mota caeteras movet."

1.3.2. Late Ancient Commentaries on the *Metaphysics*

The tightening of the link between continuity and (potential) infinite divisibility throughout the Late Ancient commentary tradition becomes all the more evident if one turns to commentaries on *Metaphysics* Δ, especially Δ.13, the chapter devoted to the elucidation of the notion of quantity. Here, indeed, as seen above, 'continuous' quantities are identified by the property of (potential) infinite divisibility. Unfortunately, the only extant commentary on the section is the one attributed to Alexander of Aphrodisias (*fl.* ca. 200 AD)[141], which allows one to see that the trend evidenced (mostly) in Neoplatonic

[141] Three other Late Ancient commentaries on the *Metaphysics* are extant. One is by Syrianus (Proclus' teacher in Athens), of which only the portions concenring Books B, Γ, M and N are extant (although it is doubtful that he ever wrote a complete commentary on the *Metaphysics*; see on this the Introduction to the English translation of the commentary on Books B and Gamma by O'Meara and Dillon referred to below). The Greek text of the commentary has been published in the *Commentaria in Aristotelem Graeca* series as SYRIANUS, *Syriani in Metaphysica commentaria (Commentaria in Aristotelem Graeca VI, pars I)*, ed. G. KROLL, Berlin, Reimer, 1902. The English translation of the commentary has been edited in the Ancient Commentators on Aristotle series in two volumes: SYRIANUS, *On Aristotle* Metaphysics *3-4*, D. O'MEARA, J. DILLON (trans.), London, Duckworth, 2008; SYRIANUS, *On Aristotle* Metaphysics *13-14*, J. DILLON, D. O'MEARA (trans.), London, Duckworth, 2006. A useful introduction to Syrianus' commentary is represented by the collected volume A. LONGO (ed.), *Syrianus et la métaphysique de l'antiquité tardive. Actes du Colloque international, Université de Genève, 29 septembre-1 octobre 2006*, Napoli, Bibliopolis, 2009. Another is a paraphrase by Themistius, which covers, however, only Book Lambda (the Greek text is not extant, but it has been partially preserved in Arabic and fully in Hebrew; the 13th-century Hebrew translation, together with the surviving Arabic fragments, has been recently edited as THEMISTIUS, *Themistius' Paraphrase of Aristotle's* Metaphysics *12. A Critical Hebrew-Arabic Edition of the Surviving Textual Evidence, with an Introduciton, preliminary Studies, and a Commentary (Aristoteles Semitico-Latinus 25)*, ed. Y. MEYRAV, Leiden, Brill, 2019, of which an English translation by the same author appeared in the *Ancient Commentators on Aristotle* series as THEMISTIUS, *On Aristotle* Metaphysics *12*, Y. MEYRAV (trans.), London, Bloomsbury, 2020). The last Late Ancient commentary on *Metaphysics* (only Books A-Z) is by Asclepius of Tralles, a commentary whose importance lies in the fact that it records the oral teachings of Philponus' master, Ammonius the son of Hermeias. The Greek text of the commentary has been published in the *Commentaria in Aristotelem Graeca* series as ASCLEPIUS, *Asclepii in Aristotelis Metaphysicorum libros A-Z commentaria (Commentaria in Aristotelem Graeca VI, Pars II)*, ed. M. HAYDUCK, Berlin, Reimer, 1888. A more recent edition, with Italian translation, of Asclepius' commentary on Book A has been recently published as ASCLEPIO DI TRALLE, *Commentario al libro Alpha Meizon (A) della* Metafisica *di Aristotele. Introduzione, testo greco, traduzione e note di commento*, ed. R.L. CARDULLO, Acireale-Roma, Bonanno, 2012. The fundamental reference work for studying the textual transmission of the Late Ancient commentaries on the *Metaphysics* is C. LUNA, *Trois études sur la tradition des commentaires anciens à la* Métaphysique *d'Aristote (Philosophia Antiqua 88)*, Leiden, Brill, 2001. Concerning the attribution of the *Metaphysics* commentary under consideration to Alexander, the majority opinion among scholars is that the commentary on Books A-Δ can be considered authentically Alexander's, while the attribution for the commentary on subsequent Books is probably spurious (they seem to have originated much later and, since Praechter, they are customarily attributed to Michael of Ephesus, a Byzantine commentator active between the 11th and the 12th century, to whom the commentary on these Books is attributed in one manuscript, namely, ms. Parisinus 1876, although there are dissenting opinions: see, for instance, L. TARÁN, *Syrianus and Pseudo-Alexander's Commentary on* Metaphysics *E-N*, in J. WIESNER (ed.), *Aristoteles, Werk und Wirkung; Paul Moraux gewidmet*, Berlin, de Gruyter, 1987, Vol. II, pp. 215-232, who thinks that the 'Pseudo-Alexander' should precede Syrianus' commentary; an effective criticism of Tarán's thesis, which shows that it is rather the Pseudo-Alexander to make use of Syrianus, is included in LUNA, *Trois études sur la tradition des commentaires anciens à la* Métaphysique *d'Aristote*,

Late Ancient commentators on the *Categories* was at least partially present also in an "orthodox" Peripatetic such as Alexander. Indeed, especially for what concerns the fact that the quantities resulting from the division of a continuous quantity are discrete one in respect to the other, while remaining continuous in themselves, is present also in his commentary on Δ.13:

> Primarily, then, it is number itself that is divided into non-continuous parts, but, as a consequence, when numbered things, each of which is continuous, are divided inasmuch as they have a number, they are not divided as [a continuum, i.e.] into continuous parts[142].

1.3.3. Late Ancient Commentaries on *Physics* V.3

Turning now to Late Ancient *Physics* commentaries, it should be noted from the outset that, even in this case, the list of the extant ones is much smaller than one would wish. Indeed, only three Late Ancient commentaries on the *Physics* are fully extant, namely the 4th-century paraphrasis by Themistius (ca. 317 AD – ca. 388 AD)[143] and the

op. cit.). The debate, however, is far from over. For a recent overview of the debate, together with an important discussion of Averroes' quotation of Alexander in the commentary on Book Λ, an aspect which is not covered by Luna's monograph, see M. DI GIOVANNI, O. PRIMAVESI, *Who Wrote Alexander's Commentary on* Metaphysics *Λ? New Light on the Syro-Arabic Tradition*, in C. HORN (ed.), *Aristotle's Metaphysics Lambda – New Essays. Proceedings of the 13th Conference of the Karl and Gertrud-Abel Foundation – Bonn, November 28th-December 1st, 2010*, Berlin, de Gruyter, 2016, pp. 11-66. The Greek text of Alexander' (and Pseudo Alexander's) commentary has been edited in the *Commentaria in Aristotelem Graeca* series as ALEXANDER APHRODISIENSIS, *Alexandri Aphrodisiensis in Aristotelis Metaphysica commentaria (Commentaria in Aristotelem Graeca I)*, ed. M. HAYDUCK, Berlin, Reimer, 1891. The English translation of the first five books has been published in the *Ancient Commentators on Aristotle* series in four volumes: ALEXANDER OF APHRODISIAS, *On Aristotle* Metaphysics *1*, W. DOOLEY (trans.), London, Duckworth, 1989; ALEXANDER OF APHRODISIAS, *On Aristotle* Metaphysics *2 & 3*, W. DOOLEY, A. MADIGAN (trans.), London, Duckworth, 1992; ALEXANDER OF APHRODISIAS, *On Aristotle* Metaphysics *4*, A. MADIGAN (trans.), London, Duckworth, 1993; ALEXANDER OF APHRODISIAS, *On Aristotle* Metaphysics *5*, W. DOOLEY (trans.), London, Duckworth, 1993. For what concerns the Pseudo-Alexander, only the translation of the commentary on Book Λ has been published so far: "ALEXANDER", *On Aristotle* Metaphysics *12*, F.D. MILLER, JR. (trans.), London, Bloomsbury, 2021. For what concerns Alexander's (and Pseudo-Alexander's) commentary, apart from the fundamental study by Luna quoted above, another work which is a useful starting point is represented by G. MOVIA (ed.), *Alessandro di Afrodisia e la* Metafisica *di Aristotele*, Milano, Vita e Pensiero, 2003.

[142] ALEXANDER OF APHRODISIAS, *On Aristotle* Metaphysics *5*, DOOLEY (trans.), *op. cit.*, p. 75. For the Greek text see ALEXANDER APHRODISIENSIS, *Alexandri Aphrodisiensis in Aristotelis Metaphysica commentaria*, ed. HAYDUCK, *op. cit.*, 396.26-29: "κυρίως μὲν οὖν ὁ ἀριθμὸς ἀυτὸς εἰς μὴ συνεχῆ διαιρετός· ἤδη δὲ καὶ τὰ ἀριθμητά, εἰ καὶ συνεχὲς ἕκαστον αὐτῶν, ἀλλ᾽ὅταν ὡς ἀριθμητὰ διαιρῆται, οὐχ ὡς εἰς συνεχῆ διαιρεῖται."

[143] The Greek text of the commentary has been edited in the *Commentaria in Aristotelem Graeca* series as THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis (Commentaria in Aristotelem Graeca V, Pars II)*, ed. H. SCHENKL, Berlin, Reimer, 1900. An English translation has appeared in Richard Sorabji's major

two 6th-century AD commentaries by Philoponus (ca. 490 AD-ca. 570 AD)[144] and Simplicius[145], to which one should add the *scholia* to the *Physics* by Alexander of

project of the *Ancient Commentators on Aristotle* series, in three volumes. THEMISTIUS, *On Aristotle* Physics *1-3*, R.B. TODD (trans.), London, Bloomsbury, 2012; THEMISTIUS, *On Aristotle* Physics *4*, R.B. TODD (trans.), London, Duckworth, 2003, and THEMISTIUS, *On Aristotle* Physics *5-8*, R.B. TODD (trans.), London, Duckworth, 2008.

[144] The commentary is preserved in Greek only for the first four books, although there exist some fragments concerning the following ones. For Philoponus' commentary on *Physics* V-VIII it is, nevertheless, possible to rely on an extant Arabic version (preserved in ms. Leiden, Or. 583, the only extant manuscript which contains an Arabic translation of the *Physics*, namely the one by Isḥāq ibn Ḥunayn), which itself is better understood as a paraphrase of Philoponus' commentary on Books III-VII, and which also includes two passages on Book VIII. The Greek text (including the full commentary on Books I-IV and the fragments referring to Books V-VIII) has been edited in the *Commentaria in Aristotelem Graeca* series in two volumes: PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria (Commentaria in Aristotelem Graeca XVI)*, ed. H. VITELLI, Berlin, Reimer, 1887, and PHILOPONUS, *Ioannis Philoponi in Aristoteliis Physicorum libros quinque posteriores commentaria (Commentaria in Aristotelem Graeca XVII)*, ed. H. VITELLI, Berlin, Reimer, 1888. The Arabic text of the *Physics* with several commentaries (passages from Philoponus's one are recognisable by the fact that they are attributed to Yaḥyā, which is the first part of the Arabic translation of 'John Philoponus', 'Yaḥyā al-Naḥwī', whereas the other 'Yaḥyā' whose commentary is quoted in the manuscript, namely Yaḥyā ibn 'Adī, is always identified with his full name) has been edited as ARISṬŪṬĀLĪS, *al-Ṭabī'a. Tarjamat Isḥāq ibn Ḥunayn ma'a šurūḥ Ibn al-Samḥ wa Ibn 'Adī wa Mattā ibn Yūnus wa Abī l-Faraj ibn al-Ṭayyib*, (2 vols.), ed. 'ABD-AR-R. BADAWI, Cairo, Al-Hay'a al- Miṣrīya al-'Āmma li-l-Kitāb, 1964-1965. An English translation of the text (based on the Greek version for Books I-IV and on the Arabic one for Books V-VIII, has appeared in the *Ancient Commentators on Aristotle* series, in nine volumes: PHILOPONUS, *On Aristotle* Physics *1.1-3*, C. OSBORNE (trans.), London, Duckworth, 2006; PHILOPONUS, *On Aristotle* Physics *1.4-9*, C. OSBORNE (trans.), London, Duckworth, 2009; PHILOPONUS, *On Aristotle* Physics *2*, A.R. LACEY (trans.), London, Duckworth, 1993; PHILOPONUS, *On Aristotle* Physics *3*, M.J. EDWARDS (trans.), London, Duckworth, 1994; PHILOPONUS, *On Aristotle* Physics *4.1-5*, K. ALGRA, J. VAN OPHUIJSEN (trans.), London, Bloomsbury, 2012; PHILOPONUS, *On Aristotle* Physics *4.6-9*, P. HUBY (trans.), London, Bloomsbury, 2012; PHILOPONUS, *On Aristotle* Physics *4.10-14*, S. BROADIE (trans.), London, Bloomsbury, 2014, and PHILOPONUS, *On Aristotle* Physics *5-8*, with SIMPLICIUS, *On Aristotle on the Void*, P. LETTINCK, J.O. URMSON (trans.), London, Duckworth, 1994; to all these volumes one should also add PHILOPONUS, *Corollaries on Place and Void, with* SIMPLICIUS, *Against Philoponus on the Eternity of the World*, D.J. FURLEY, C. WILDBERG (trans.), London, Duckworth, 1991, inserted after his commentary on IV.5 and IV.9 respectively. For what concerns the Arabic text of Philoponus' commentary, as well as a detailed analysis of the Leiden manuscript and a detailed comparison of the Greek and Arabic text, when both are available, see E. GIANNAKIS, *Philoponus in the Arabic Tradition of Aristotle's* Physics, Ph.D. thesis, Oxford, University of Oxford, 1992. Another independent comparison is proposed in P. LETTINCK, *Aristotle's* Physics *and its Reception in the Arabic World. With an Edition of the Unpublihsed Parts of Ibn Bājja's Commentary on the* Physics *(Aristoteles Semitico-Latinus 7)*, Leiden, Brill, 1993. Generally speaking, a comparison clearly shows that the Arabic text, apart from summarising the Greek one, does not significantly differ from it, except, perhaps, for what concerns the character of the examples given by Aristotle, which have been adapted to an Arabic audience, and the order of sentences (together with some additions and occasional modifications of the contents).

[145] The Greek text of the commentary has been edited in the *Commentaria in Aristotelem Graeca* series in two volumes: SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria (Commentaria in Aristotelem Graeca IX)*, ed. H. DIELS, Berlin, Reimer, 1882, and SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor posteriores commentaria (Commentaria in Aristotelem Graeca X)*, ed. H. DIELS, Berlin, Reimer, 1895. An English translation has appeared in the *Ancient Commentators on Aristotle* series, in fourteen volumes: SIMPLICIUS, *On Aristotle* Physics *1.1-2*, S. MENN (trans.), London, Bloomsbury, 2022; SIMPLICIUS, *On Aristotle* Physics *1.3-4*, P. HUBY, C.C.W. TAYLOR (trans.), London, Bloomsbury, 2011; SIMPLICIUS, *On Aristotle* Physics *1.5-9*, H. BALTUSSEN, M. ATKINSON, M. SHARE, I. MUELLER (trans.), London, Bloomsbury, 2012; SIMPLICIUS, *On Aristotle* Physics *2*, B. FLEET (trans.), London, Duckworth, 1997; SIMPLICIUS, *On Aristotle* Physics *3*, J.O. URMSON (trans.), notes by P.

Aphrodisias which have been partially reconstructed (for Books IV-VIII) by Marwan Rashed thanks to the *scholia* in some Byzantine manuscripts and to Simplicius' quotations[146].

My aim in analysing the four Late Ancient commentaries on the *Physics* will be to focus on some specific questions. For what concerns *Physics* V.3, where, as seen above, Aristotle introduces the definition of continuity (as the culmination of a series of seven terms dealing with spatial relations between objects), the main questions which will be dealt with are:

1. How did Late Ancient commentators interpret Aristotle's definition of 'being together in the same primary place'?
2. How did Late Ancient commentators distinguish between Aristotle's notions of 'touching' and of 'contiguity'?

These are, indeed, the main points concerning which Late Ancient commentators innovate over Aristotle's text. Interestingly, as I will show below, the definition of 'being together in the same primary place' is understood in wildly diverging terms by

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LAUTNER, London, Duckworth, 2002; SIMPLICIUS, *On Aristotle* Physics *4.1-5 and 10-14*, J.O. URMSON (trans.), London, Duckworth, 1992; SIMPLICIUS, *On Aristotle on the Void*, *op. cit.* (which corresponds to Simplicius' commentary on IV.6-9); SIMPLICIUS, *On Aristotle* Physics *5*, J.O. URMSON (trans.), notes by P. LAUTNER, London, Duckworth, 1997; SIMPLICIUS, *On Aristotle* Physics *6*, D. KONSTAN (trans.), London, Duckworth, 1989; SIMPLICIUS, *On Aristotle* Physics *7*, C. HAGEN (trans.), London, Duckworth, 1994; SIMPLICIUS, *On Aristotle* Physics *8.1-5*, I. BODNÁR, M. CHASE, M. SHARE (trans.), London, Bloomsbury, 2012; SIMPLICIUS, *On Aristotle* Physics *8.6-10*, R.D. MCKIRAHAN (trans.), London, Duckworth, 2001; to all these volumes one should also add SIMPLICIUS, *Corollaries on Place and Time*, J.O. URMSON (trans.), annotated by L. SIORVANES, London, Duckworth, 1992, which presents two digressions, respectively on place and time, from Simplicius' commentary on Book IV (the former taking place after Simplicius' commentary on IV.5, and the latter after Simplicius' commentary on IV.14). It is to be remarked that part of Simplicius' commentary ha salso been translated in French (SIMPLICIUS, *Commentaire sur la* Physique *d'Aristote. Livre II, ch. 1-3, Introduction, traduction, notes et bibliographie par* A. LERNOULD, Villeneuve d'Ascq, Presses universitaires du Septentrion, 2019), and in German (SIMPLIKIOS, *Über die Zeit. Ein Kommentar zum Corollarium de Tempore (Hypomnemata 70)*, E. SONDEREGGER (ed.), Göttingen, Vandenhoeck & Ruprecht, 1982).

[146] The Byzantine *scholia* are those included in two manuscripts of the *Physics* (ms. Paris. Suppl. gr. 643 and ms. Paris. Gr. 1859). The Greek text (based on these *scholia* and on Simplicius' quotations, as mentioned above), together with a French translation and an extended introduction and commentary, has been edited as ALEXANDRE D'APHRODISE, *Commentaire perdu à la* Physique *d'Aristote. Édition, traduction et commentaire (Livres IV-VIII) (Commentaria in Aristotelem Graeca et Byzantina, Quellen und Studien, Band 1)*, ed. M. RASHED, Berlin-New York, NY, de Grutyer, 2011. Some fragments of the commentary have also been preserved in Arabic (see, on this, E. GIANNAKIS, "Fragments from Alexander's Lost Commentary on Aristotle's *Physics*", *Zeitschrift für Geschichte der arabisch-islamischen Wissenscaften* 10, 1995-1996, pp. 157-187).

commentators. Indeed, just to quote the two most extreme cases, Alexander equates such definition with that of continuity itself (or, better, their respective referents): in his interpretation, everything that is together in the same primary place is necessarily continuous, and viceversa. This eliminates entirely the idea of a theoretical progression from the definition of 'being together in the same primary place' to that of continuity, a progression that, as I have mentioned above, structures the entire Aristotelian chapter. At the other end of the spectrum, Simplicius understands 'being together in the same primary place' as a property admitting degrees, so that, in a sense, everything can be said to be together with everything else insofar as there is no third object contained by a surface that contains both of them. Of course, two things in the same room (to use Simplicius' example) are "more together" than two things in different rooms of the same house, and so on. These divergent interpretations evidently testify to the difficulty of the commentators to understand the definition of 'being together in the same primary place' provided by Aristotle, and also, as a consequence, the conceptual process by which Aristotle moves from it towards the definition of continuity. This, I think, has progressively contributed to diminish the effectiveness of Aristotle's definition of continuity in *Physics* V.3, which is best understood as a culmination of all the possible spatial relations between objects described by Aristotle in the chapter, and, correlatively, to make the understanding of continuity increasingly more dependent on a recourse to the notion of (potential) infinite divisibility.

Concerning the second question mentioned above, two main lines of interpretation emerged in Late Ancient commentaries on *Physics* V.3. On the one hand, Alexander and Simplicius both believe that the property of contiguity is different from mere touching because only things of the same species (or, in Simplicius, of the same genus) can be contiguous, while things of different species can only be said to touch, but not to be contiguous. Alexander's and Simplicius' reading is evidently based on Aristotle's definition of 'in succession', although they intend it in a much more specific way than what the Aristotelian text allows to infer. As I have remarked above, indeed, two things are in succession, according to Aristotle, when there is nothing of the same kind between them, and two things are contiguous only when they touch and they are in succession. Still, Aristotle, as his example makes clear, was not using 'kind' in the usual, technical sense that the word has in his writings. Rather, he merely aimed at distinguishing the case

of geometrical entities from that of "enmatter" magnitudes and from that of discrete quantities such as (natural) numbers. Nevertheless, Alexander and Simplicius evidently took the reference to species (or to genera more generally) to be to the usual technical meaning of the term. Moreover, they interpreted such reference, in a technical sense, as the fundamental criterion not only to define 'in succession', but also, *e contrario*, to define contiguity itself. On the other hand, Themistius and Philoponus do not use the criterion of 'kind' in its technical sense to distinguish between touching and being contiguous, but they do use the exact same line of reasoning to claim that, among contiguous things, only those of the same genus can become continuous (something which, of course, is also entailed by Alexander's and Simplicius' line of interpretation).

1.3.3.1. Alexander of Aphrodisias

Alexander's *scholia* on *Physics* V.3, as mentioned, reserve an important surprise for what concerns the first question mentioned above. Indeed, Alexander claims that "the things which are together according to place are necessarily continuous with each other" (26b21)[147]. In the previous section, the discussion of Aristotle's definition of 'together in a primary place' has been interpreted in a restrictive way, pointing towards the idea that only the surfaces of two objects, by touching and thus coming to coincide, can be said to be together in the same primary place, according to the definition of *Physics* IV.5. Now, Alexander is, in a sense, even more restrictive in his interpretation of the passage: he claims that only by being continuous two objects can be said to be in the same primary place. This interpretation is certainly helpful, in that it provides an explanation of the passage which is fully consistent with the discussion of *Physics* IV.5, yet, at the same time, it must be noted that Alexander sacrifices, to this aim, the distinction between 'together' and 'continuous', a price which many later commentators will find too high to pay[148].

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[147] ALEXANDRE D'APHRODISE, *Commentaire perdu à la* Physique *d'Aristote (Livres IV-VIII)*, ed. RASHED, *op. cit.*, p. 318: "<ἅμα>] τὰ κατὰ τόπον ἅμα ἐξ ἀνάγκης συνεχῆ ἀλλήλοις εἰσίν." Rashed accompanies the edition with a French translation, which reads (cf. *ibidem*): "<ensemble>] Les choses qui sont ensemble selon le lieu sont nécessairement continues les unes aux autres." All the English translations from this commentary are mine, although they are based on Rashed's French translation.

[148] Rashed thinks that Alexander is here motivated by a critique against Stoic ontology (cf. ALEXANDRE D'APHRODISE, *Commentaire perdu à la* Physique *d'Aristote (Livres IV-VIII)*, ed. RASHED, *op. cit.*, p. 318). In any case, Alexander is aware of the difficulties involved in his interpretation of 'together in the same

Equally interesting is Alexander's discussion of the distinction between 'touching' and 'contiguity'. As seen, the Aristotelian text does not provide a clear mean to distinguish the two terms, while Alexander does supply a principled criterion:

> <In being successive>] that both things which do not belong to the same genus touch each other, e.g. an animal touches a stone, and things which do not belong to the same species, such as an ox touches a horse; that only things of the same species are contiguous with each other, insofar as they touch each other, because the notion of touching has a wider extension than that of contiguity. Indeed, even the things which are not of the same species touch each other (27a6)[149].

Alexander's explanation is simple, and consistent with his "essentialist" interpretation of Aristotle's natural philosophy[150]: the reference to species provides the key to the distinction between 'touching' and 'contiguous'. Indeed, as mentioned, Aristotle does refer to "essentialist" considerations in the definition of 'being in succession', by claiming that two things are in succession only if there is nothing of the same genus between them. Now, Alexander extends this reference in a creative way, by claiming that only things which belong to the same species (τὰ ὁμοειδῆ) can be 'contiguous'. Things which are not

primary place'. According to Simplicius' testimony, Alexander distinguished two meanings of 'together'. The former, used in the definition of 'together in the same primary place', makes 'together' a synonym of continuous. The latter, used in the definition of 'being in contact' as 'having the extremities together', makes 'together' a synonym of 'exactly fitting', a notion taken straight out of Euclid's *Elements*, where it indicated the case of – roughly speaking – two coinciding entities (especially two surfaces). Simplicius is, evidently, very critical of the former meaning of 'together', as it will be shown below, as an utter misreading of Aristotle (cf. SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor posteriores commentaria*, ed. DIELS, *op. cit.*, 870,10-871, 15). On the whole issue see FURLEY, *The Greek Commentators' Treatment of Aristotle's Theory of the Continuous*, *op. cit.*, esp. section 3.

[149] ALEXANDRE D'APHRODISE, *Commentaire perdu à la* Physique *d'Aristote (Livres IV-VIII)*, ed. RASHED, *op. cit.*, p. 323: "<ἐφεξῆς ὂν>] ὅτι ἅπτεται μὲν καὶ ἀνομογενῆ οἷον ζῷον λίθου καὶ ἀνομοειδῆ οἷον βοῦς ἵππου, συνέχεται δὲ μόνα ἀλλήλων τὰ ὁμοειδῆ ὡς ἁπτόμενα, ὅτι ἐπὶ πλέον τὸ ἅπτομενον τοῦ ἐχομένου. ἅπτεται γὰρ καὶ τὰ ἀνομοειδῆ." In Rashed's translation: "<en étant successif>] Que se touchent aussi bien des choses qui n'appartiennent pas au même genre, comme un animal touche une pierre, que des choses qui n'appartiennent pas à la même espèece, comme un bœuf touche un cheval; que sont contiguës entre elles seulement les choses de même espèce, dès lors qu'elles se touchent, du fait que la notion de contact a plus d'extension que celle de contiguïté. Se touchent en effet les choses qui ne sont pas de même espèce aussi bien" (*ibidem*).

[150] On this topic, the fundamental reference point is M. RASHED, *Essentialisme. Alexandre d'Aphrodise entre logique, physique et cosmologie (Commentaria in Aristotelem Graeca et Byzantina. Quellen und Studien 2)*, Berlin, de Gruyter, 2007, and the helpful discussion of the book in I. KUPREEVA, *Alexander of Aphrodisias on Form. A discusssion of Marwan Rashed*, Essentialisme, in B. INWOOD (ed.), *Oxford Studies in Ancient Philosophy 38*, Oxford, Oxford University Press, 2010, pp. 211-249.

of the same species can well be said to touch each other, but not to be contiguous with each other[151].

These are probably the main aspects in which Alexander's *scholia* innovate on Aristotle's text of *Physics* V.3[152].

1.3.3.2. Themistius

The most notable aspect of Themistius' paraphrase of *Physics* V.3 is certainly the fact that he does not provide an interpretation of the notion of 'being together in the same primary place', since he does not even mention the first three of the seven terms discussed in the chapter, focusing only on the last four, namely, 'between', 'in succession', 'contiguity', and 'continuity'. This clearly shows both that these were clearly perceived as the main conceptual elements of the chapter, and that the exegesis of the previous terms, and of their relation with the latter ones, appeared problematic. Nevertheless, Themistius, in respect to the second question mentioned above, i.e., the distinction between touching and contiguity, Themistius does not use, like Alexander, the reference to the notion of species, to distinguish between touching and contiguity[153], but, as said above, he is explicitly committed to the claim that only things "naturally disposed to become one" (ὅσα ἓν γίνεσθαι πέφυκεν), among contiguous entities, can become continuous with each other:

> And not everything that is contiguous is continuous, but [only] those things naturally disposed to become one (e.g. wood is in contact with stone, but could not become continuous with it). But it should not go unrecognized that the things that become

[151] And, therefore, not even continuous: in this way Alexander is therefore able to exclude *a priori* that things of different species can ever become continuous, since, as seen, what is continuous in Aristotelian terms is always contiguous.

[152] At least the ones more relevant to the topic of this thesis. Many other aspects would be worth exploring, such as Alexander's claim that continuity applies to mathematical entities and to sensible bodies o*n an equal footing* (see *scholium* n. 261, 27a16, on p. 324 of ALEXANDRE D'APHRODISE, *Commentaire perdu à la* Physique *d'Aristote (Livres IV-VIII)*, ed. RASHED, *op. cit.*).

[153] Themistius seems rather to believe that the difference between touching and being contiguous merely depends on what are the entities to which these properties apply: two objects can touch one another, but only their extremities (more precisely, two of their extremities) can be contiguous (cf. THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, *op. cit.*, 173.25-27: "ἅπτεται δε, ὧν τὰ ἄκρα ἅμα, ἄκρα δὲ λέγω τὰ πέρατα. ὅταν μὲν οὖν δύο ᾖ ταῦτα τὰ πέρατα, τότε ἔχεσθαι μὲν ἀλλήλων λέγεται καὶ εἶναι ἐφεξῆς, οὐκέτι δὲ εἶναι συνεχῆ" (THEMISTIUS, *On Aristotle* Physics *5-8*, TODD (trans.), *op. cit.*, p. 33: "And in contact are the things of which the extremities are together, and by 'extremities' I am speaking of limits. So when these limits are two, they are spoken of as contiguous to one another and in succession, but not to the extent of being continuous").

> continuous in a strict sense are those for which contact achieves fusion (as in the case of lines, grafted plants, and a time period), and some become continuous even in the case of artisanship (e.g., pieces of wood [fused] by nails or glue), but these are not also continuous in a strict sense[154].

1.3.3.3. Philoponus

Philoponus' discussion of *Physics* V.3 is first of all distinguished by the fact that he reads the chapter as a preparation to Book VI, therefore he reads all the terms discussed by Aristotle in the chapter as referring primarily to the case of motion. Yet, when it comes to the interpretation of the meanings of each of the terms, Philoponus seems to be quite close to Alexander[155]. He, for instance, interprets Aristotle's definition of 'touching' as referring to two objects whose surfaces coincide[156]. Moreover, when it comes to the first question mentioned above, namely, the definition of 'being together in the same primary place', Philoponus provides a definition of 'being together in the same primary place' that, although not going as far as Alexander's one, clearly points towards a very restrictive interpretation (one in which two things are together in the same primary place only when their "parts", or, more properly, their extremities, coincide):

> We do not say that Zayd and 'Amr are together in one and the same place, if they are both [merely] in the same town. We say that they are in the same place when one place surrounds them, in the way that water is in a mug and all the parts of the water are together in the same place (the mug). This only occurs when the boundaries of the parts are not separated. Thus we do not say that the thin, flat loaf of bread which is spread beneath the food is in one place, because each grain is separate from the others[157].

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[154] THEMISTIUS, *On Aristotle* Physics *5-8*, TODD (trans.), *op. cit.*, p. 33. The Greek text is as follows: "γίνεται δὲ οὐ πάντα τὰ ἐχόμενα συνεχῆ, ἀλλ᾽ὅσα ἓν γίνεσθαι πέφυκεν· ἅπτεται γὰρ τὸ ξύλον τοῦ λίθου, ἀλλ᾽οὐκ ἂν γένηται συνεχές. οὐ δεῖ δὲ ἀγνοεῖν, ὅτι κυρίως συνεχῆ γίνεται, ὧν ἡ ἁφὴ σύμφυσιν ἀπεργάζεται, ὡς ἐπὶ τῶν γραμμῶν καὶ τῶν ἐγκεντριζομένων φυτῶν καὶ τοῦ χρόνου, γίνεται δὲ καὶ ἐπὶ τεχνήσεώς τινα συνεχῆ, οἷον ξύλα γόμφοις ἢ κόλλῃ, ἅπερ οὐδὲ συνεχῆ κυρίως" (THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, *op. cit.*, 173.29-174.1).

[155] Which, interestingly, is the only commentator quoted by name in Philoponus' commentary on *Physics* V.3 (cf. 543.12).

[156] Cf. ARISṬŪṬĀLĪS, *al-Ṭabī'a. Tarjamat Isḥāq ibn Ḥunayn ma'a šurūḥ Ibn al-Samḥ wa Ibn 'Adī wa Mattā ibn Yūnus wa Abī l-Faraj ibn al-Ṭayyib*, ed. BADAWI, *op. cit.*, 539.2-5 (and the corresponding translation in PHILOPONUS, *On Aristotle* Physics *5-8*, with SIMPLICIUS, *On Aristotle on the Void*, LETTINCK, URMSON (trans.), *op. cit.*, pp. 46-47). In this passage, moreover, Philoponus draws an interesting distinction between 'parts', 'boundaries' and 'surfaces', where 'parts' (as three-dimensional entities) can never be in the same primary place and boundaries cannot insofar as "they are not bodies", thus leaving only 'surfaces', as two-dimensional "limits" of a body, as being the proper subject of Aristotle's definition.

[157] ARISṬŪṬĀLĪS, *al-Ṭabī'a. Tarjamat Isḥāq ibn Ḥunayn ma'a šurūḥ Ibn al-Samḥ wa Ibn 'Adī wa Mattā ibn Yūnus wa Abī l-Faraj ibn al-Ṭayyib*, ed. BADAWI, *op. cit.*, 538.10-15. The translation is taken from

More than this, Philoponus agrees with Themistius' claim that, among contiguous things, two things need to be of the same genus (in this sense Philoponus uses a more precise formulation than Themistius' own one) if they are to be united so as to become continuous. This is claimed when Philoponus comes to the discussion of 'continuity' itself at 227a13-17, where he clearly says that:

> It is possible for things to be united only if they are of the same kind, not of different kinds. Things of the same kind are for instance the wet and liquid things. Liquid things most properly and primarily admit of becoming united[158].

1.3.3.4. Simplicius

Notoriously, Simplicius' *Physics* commentary is a treasure trove of quotations and remarks concerning previous commentators, and, above all, a tribute to prolixity. I will therefore not even try to get into the details of such commentary, but, rather, I will simply highlight the elements which are dialectically related to the ones mentioned above concerning previous commentators. Now, the first important element in Simplicius' analysis of *Physics* V.3 is his discussion of the notion of 'being together in the same primary place'. Simplicius first recalls Alexander's position which (consistently with what is reported in the Byzantine *scholium* quoted above) equates 'being together in the same primary place' with being continuous. Simplicius notices that this would run against Aristotle's exposition, according to which things whose extremities are together can touch (or be contiguous) without also being continuous. Therefore, he proposes an alternative interpretation which, however, runs the opposite risk than Alexander's one (i.e., that of being too permissive). According to Simplicius, the relational property of 'togetherness' comes in degrees. Therefore:

> Things are more strictly said to be together when in the lesser place said to be the same. For things in the same house are more strictly said to be together than those in

PHILOPONUS, *On Aristotle* Physics *5-8*, with SIMPLICIUS, *On Aristotle on the Void*, LETTINCK, URMSON (trans.), *op. cit.*, p. 46.

[158] ARISṬŪṬĀLĪS, *al-Ṭabīʿa. Tarjamat Isḥāq ibn Ḥunayn maʿa šurūḥ Ibn al-Samḥ wa Ibn ʿAdī wa Mattā ibn Yūnus wa Abī l-Faraj ibn al-Ṭayyib*, ed. BADAWI, *op. cit.*, 548.8-10. The translation is taken from PHILOPONUS, *On Aristotle* Physics *5-8*, with SIMPLICIUS, *On Aristotle on the Void*, LETTINCK, URMSON (trans.), *op. cit.*, p. 50.

> the same city, and those in the same room than those in the same house and those in a part of it than those in the room; and simply those in the first individual same place (τὰ ἐν τῷ πρώτω ἀτόμῳ) which does not also contain other solid bodies, even if there is air between them, and even if they are not continuous nor touching, those are what are strictly together[159].

What is interesting is that Simplicius' interpretation allows for two objects to be together in the same primary place even when they are not touching, provided that, in the space delimited by a surface that contains both of them (what he curiously refers to with the expression of 'πρώτος ἄτομος'), there is no third object[160].

For what concerns the second of the topics mentioned above which are of particular relevance in the Late Ancient commentators' interpretation of *Physics* V.3, namely, that of 'contiguity', Simplicius is at once with Alexander (although referring to genera rather than to species):

> For things contiguous must be of the same kind and must have nothing between them either of the same or of a different kind. That is why they are not only next but also touching[161].

Here Simplicius accepts the distinction between touching and contiguity based on the fact that the latter, but not the former, requires that the two objects concerned are of the same genus[162].

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[159] SIMPLICIUS, *On Aristotle* Physics *5*, URMSON (trans.), notes by LAUTNER, *op. cit.*, p. 71. For the Greek text, see SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor posteriores commentaria*, ed. DIELS, *op. cit.*, 869.24-29: "κυριώτερον δὲ ἅμα λέγεται τὰ ἐν ἐλάσσονι τῷ αὐτῷ· τὰ γὰρ ἐν τῇ αὐτῇ οἰκίᾳ τῶν ἐν τῇ αὐτῇ πόλει κυριώτερον ἅμα λέγεται καὶ τῆς οἰκίας τὰ ἐν τῷ αὐτῷ οἰκήματι καὶ τοῦ οἰκήματος τὰ ἐν μέρει, καὶ ἁπλῶς τὰ ἐν τῷ πρώτω ἀτόμῳ τῷ αὐτῷ τῷ μὴ καὶ ἄλλα σώματα στερεὰ περιέχοντι, κἂν ἀήρ τις ᾖ μεταξύ, κἂν μῆ συνεχῆ ᾖ μηδὲ ἁπτόμενα, ταῦτα κυρίως ἅμα."

[160] Simplicius acknowledges, in this respect, that a more restrictive interpretation could also be possible, such as the (extreme) one he ascribes to Eudemus, according to which it is never possible to say, properly, that two objects are in the same primary place (not even two entities which are mixed together), once the Aristotelian definition of 'primary place' is taken into account (cf. *ibid.*, 870.1-5).

[161] SIMPLICIUS, *On Aristotle* Physics *5*, URMSON (trans.), notes by LAUTNER, *op. cit.*, p. 77. For the Greek text, see SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor posteriores commentaria*, ed. DIELS, *op. cit.*, 877.11-12: "ὁμογενῆ γὰρ δεῖ εἶναι τὰ ἐχόμενα καὶ μηδὲν ἔχειν μεταξὺ μήτε ὁμογενὲς μήτε ἀνομογενές. διὸ οὐ μόνον ἐφεξῆς ἐστιν, ἀλλὰ καὶ ἁπτόμενα."

[162] Simplicius is also at once with his predecessors, and he goes even further than them, when he notices that continuity entails unity (albeit not viceversa), thus linking the discussion of *Physics* V.3 with the passages of the *Metaphysics* where Aristotle discusses 'continuity' as a kind of *per se* unity (thus having in itself the cause of its being one).

1.3.4. Late Ancient Commentaries on *Physics* VI.1-2

Late Ancient commentaries on *Physics* VI.1-2 are important for various reasons. Indeed, as I will show below, they (certainly Alexander, Themistius and Simplicius, but probably also Philoponus) significantly enlarged the scope of Aristotle's criticism of Democritean atomism by applying the second argument adopted by Aristotle in *Physics* VI.1 against the theory of instantaneous motion developed by Epicurus (or, according to some recent interpretations, at least in part developed by later followers of Epicurus)[163]. This theory, indeed, as presented by Alexander, Themistius and Simplicius, seems to have been at least partially devised to protect atomism from this specific line of criticism. According to it, all magnitudes (and so also the space over which motion occurs) are composed of extended indivisible parts (atoms), which, however, are in themselves composed of (and measured by) ἐλάχιστα, which are interpreted as "minimal spatial extensions" having no parts whatsoever, incapable of existing on their own and joining in a "continuous" way in atoms. It is exactly thanks to the feature of their "partlessness" (an aspect which makes them indivisible not only "physically" but also conceptually) that such ἐλάχιστα can be used against Aristotle's second argument in *Physics* VI.1, which, as seen, is exactly based on the observation that any supposedly ("physically") indivisible space over which motion occurs still has an extension, thus has parts and is, therefore, conceptually divisible (and the same, of course, is true of the supposedly "physically" indivisible moving object). Insofar as, however, ἐλάχιστα are taken to be not only "physically", but also conceptually indivisible (therefore lacking any parts) motion over each of these ἐλάχιστα necessarily occurs instantaneously (assuming an isomorphic structure of magnitude, motion, and time as ultimately composed of ἐλάχιστα[164]). As a result, the duration of the overall motion over a number of them merely depends on the time in which the moving body remains at rest between any two instantaneous motions

[163] This position has been most prominently argued for, in recent studies, in F. VERDE, Elachista. *La dottrina dei minimi nell'epicureismo (Ancient and Medieval Philosophy Series 1, 48)*, Leuven, Leuven University Press, 2013. According to Verde, Epicurus' original theory applied primarily to the composition of atoms themselves, whereas later followers progressively shifted the focus to the composition of space and time (on this issue, with a specific focus on time, see also M. GŒURY, "L'atomisme épicurien du temps à la lumière de la *Physique* d'Aristote", *Les Études philosophiques* 107 (4), 2013, pp. 535-552).

[164] This has not been accepted unanimously by scholars. See, for instance, F. CAUJOLLE-ZASLAWSKY, "Le temps Épicurien est-il atomique?", *Les Études philosophiques* 3, 1980, pp. 285-306.

over two ἐλάχιστα[165]. The basic argumentative strategy adopted by Alexander, Themistius and Simplicius against this theory is to claim that Aristotle's argument can be applied to it as well, by claiming that (I will show below in what specific ways), even according to Epicurean atomism it is not possible to escape the contradiction that, since a moving body is never moving but, at any given instant, it has already moved, every motion is ultimately composed of rests, rather than of motions. Regardless of whether or not this strategy is successful, what bears underlining here is that, in this way, Late Ancient commentators reinforced the anti-atomistic character of Aristotle's theory of the continuity of magnitudes, motion and time.

More than that, Themistius also inserted in the commentary on *Physics* VI.1 a new anti-atomistic argument taken from Eudemus of Rhodes, therefore originating in the context of the geometrical tradition. This is, of course, in line with Aristotle's own argumentative strategy against atomism in the chapter. Indeed, as I have shown above, the first argument presented by Aristotle against atomism in *Physics* VI.1 is ultimately geometrical in character, considering the case of geometrical points as unextended indivisible entities, while the second one focuses on the case of extended indivisibles as the ultimate components of magnitudes, motions and time. Nevertheless, the argument adopted by Themistius fundamentally complicates the picture, insofar as, while being explicitly meant to apply to lines as geometrical entities, it considers points as *extended* indivisible entities. In this way, Themistius seems to confuse the two planes of the discussion that Aristotle had always kept separate, i.e., that of geometry and the "physical" one of magnitudes, motion and time. This confusion, through the reference to the argument quoted by Themistius and also of analogous ones, as I will show below, will

[165] This presentation is admittedly extremely simplistic. However, a full discussion of the theory of instantaneous motion (and of the composition of magnitudes, motion and time) of Epicurean atomism lies outside the scope of the present thesis. For important remarks on it and on its overall theoretical background, in addition to Francesco Verde's volume quoted above (which remains the most comprehensive introduction, to date, of the Epicurean doctrine of ἐλάχιστα to date) and to the article by Gœury, all the studies quoted below and also D. KONSTAN, "Problems in Epicurean Physics", *Isis* 70 (3), 1979, pp. 394-418, R.R.K. SORABJI, *Atoms and Time Atoms*, in KRETZMANN (ed.), *Infinity and Continuity in Ancient and Medieval Thought, op. cit.*, pp. 37-86 and also, evidently, R.R.K. SORABJI, *Time, Creation and the Continuum. Theories in Antiquity and the Early Middle Ages*, London, Duckworth, 1983, pp. 371-377. Note that the only text that provides a basis for this doctrine in Epicurus' extant *corpus* is the *Letter to Herodotus* (58-59), where the doctrine of ἐλάχιστα, significantly, is introduced thanks to a comparison with the notion of a minimally extended perceivable part of bodies, whereas the doctrine, although with some differences, is also present in Lucretius' *De rerum natura* (I, 599-634 and 746-752). In both cases, it should be noted, the doctrine is explicitly applied only to the composition of magnitudes, not of motion and time as well.

also remain present in the Medieval Latin debate on atomism, therefore giving rise to what Christophe Grellard has aptly called a "categorial mistake" ("une erreur catégorielle")[166].

All in all, nevertheless, it is clear that Late Ancient commentators reinforced the link between continuity and (potential) infinite divisibility made explicit by Aristotle in *Physics* VI.1-2, and especially its anti-atomistic implications. Yet, as I will mention below, they never went to the point of considering (potential) infinite divisibility the true definition of continuity, not even when commenting on the problematic Aristotelian passage of *Physics* VI.2, 232b22-23.

1.3.4.1. Alexander

Alexander's *scholia* do not devote a peculiar space to the issue of defining the relation between continuity and (potential) infinite divisibility. The only element of relevance in this respect in Alexander's *scholia* on *Physics* VI.1-2, something which is extremely important historically, is his reference to the way in which Epicurus tried to avoid Aristotle's second argument presented in *Physics* VI.1 concerning the continuity of magnitudes, motion and time:

> Chronologically posterior, Epicurus claimed that the time as well as the movement and the magnitude are composed of elements without parts, but that if what is moved moves over the whole magnitude composed of elements without parts, nevertheless, in each of the elements without parts that it [i.e., the magnitude] contains, it does not move but it has moved. He [i.e., Epicurus] foresaw, indeed, that if he posited that what moves over the whole moves also over the elements without parts, it would be necessary that the latter be divisible. It is, therefore, this hypothesis that Aristotle, after having presented it, refutes now[167].

[166] See the reference below, in n. 177.

[167] ALEXANDRE D'APHRODISE, *Commentaire perdu à la* Physique *d'Aristote (Livres IV-VIII)*, ed. RASHED, *op. cit.*, pp. 355-356: "<...>] ὕστερος τὸν χρόνον ὁ Ἐπίκουρος ἔλεγεν ὅτι καὶ ὁ χρόνος καὶ ἡ κίνησις καὶ τὸ μέγεθος ἐξ ἀμερῶν εἰσιν. ἀλλ᾽ἐπὶ τοῦ μεγέθους ὅλου τοῦ ἐξ ἀμερῶν κινεῖται τὸ κινούμενον, καθ᾽ἕκαστον δὲ τῶν ἐν αὐτῷ ἀμερῶν οὐ κινεῖται ἀλλὰ κεκίνηται. ὑπενόει γὰρ ὅτι εἰ τεθείη καὶ ἐπὶ τῶν ἀμερῶν κινεῖσθαι τὸ ἐπὶ τοῦ ὅλου κινούμενον, δεῖ διαίρετα αὐτὰ ἔσεσθαι. ταύτην οὖν τὴν ὑπόθεσιν νῦν ὁ Ἀριστοτέλης θεὶς ἐξελέγχει." In Rashed's translation: "<...>] Chronologiquement postérieur, Épicure affirmait qu'aussi bien le temps que le mouvement que le grandeut sont composés d'éléments sans parties, mais que si le mû se meut sur la grandeur tout entière composée des éléments sans parties, cependant, en chacun des éléments sans parties qu'elle contient, il ne se *meut* pas mais *s'est mû*. Il pressentait en effet que s'il posait que ce qui se meut sur l'ensemble se meut aussi sur les éléments sans parties, il faudrait que ces derniers soient divisibles. C'est donc cette hypothèse qu'aristote, après l'avoir avancée, réfute maintenant" (*ibid.*, p. 356, italics added in the translation).

The passage, which finds close parallels both in Themistius' and in Simplicius' commentaries[168], is extremely interesting for various reasons. Firstly, it introduces Epicurus' already mentioned instantaneous theory of motion into the debate about the continuity of magnitudes, motion and time conducted by Aristotle in *Physics* VI.1. Secondly, as Marwan Rashed has importantly noted[169], the presence of this remark points towards the creation of a "doxography", within the Peripatetic school of the early Imperial age, regarding the refutation of Epicurean atomism, a doxography which tries to adapt Aristotle's arguments to Epicurus' reformulation of ancient atomism. In this respect, the *scholium* does not provide a detailed reply to Epicurus, since it simply assumes that Aristotle's second argument in the chapter will hold both for Leucippus' and Democritus' atomism and for Epicurus' one. A more detailed explanation of Epicurus' theory and of the way in which it is refuted by Aristotle's argument will be found in the analysis of the parallel passages from Themistius and Simplicius, and it will therefore be discussed later in this section.

A question which, however, arises already in the context of Alexander's *scholium* is that of the historical link between Epicurus' theory of motion and Aristotle's criticism of atomistic motion in *Physics* VI.1[170]. Was Epicurus aware (directly or indirectly) of the contents of *Physics* VI.1, and, in the positive case, did he develop his theory in a way to make it invulnerable from Aristotle's arguments? None of the two questions can find a satisfactory answer in contemporary scholarship[171]. There is a certain consensus, it is

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[168] Cf. THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, *op. cit.*, 184.9-28 and SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor posteriores commentaria* Simplicius, ed. DIELS, *op. cit.*, 934.23-30, both commented below. The two passages correspond to fr. 278 in the standard collection of Epicurean fragments edited as H. USENER (ed.), *Epicurea*, Leipzig, Teubner, 1887 (and all its numerous reprints, such as, for instance, ID. (ed.), *Epicurea (Cambridge Library Collection)*, Cambridge, Cambridge University Press, 2010).

[169] Cf. ALEXANDRE D'APHRODISE, *Commentaire perdu à la* Physique *d'Aristote (Livres IV-VIII)*, ed. RASHED, *op. cit*., p. 356: "[…] on est conduit à faire remonter la doxographie épicurienne à l'érudition péripatéticienne orthodoxe. C'est l'école impériale qui, pressée par la concurrence avec des Épicuriens toujours actif, dut développer une interpretation historique du rapport entre l'atomisme de Leucippe et de Démocrite, sa refutation par Aristote et l'atomisme d'Épicure."

[170] In my discussion of this issue, I follow Rashed's presentation (ALEXANDRE D'APHRODISE, *Commentaire perdu à la* Physique *d'Aristote (Livres IV-VIII)*, ed. RASHED, *op. cit*., pp. 356-358).

[171] While there is a general consensus in replying positively to both of them in Late Ancient commentaries. Paradigmatically, in the commentary on the opening passage of *Physics* VI.1, Simplicius writes: "Aristotle refuted the view of Leucippus and Democritus in many places, and it is because of those refutations in objection to partlessness [i.e., of atoms], no doubt, that Epicurus, coming afterwards but sympathetic to the view of Leucippus and Democritus concerning primary bodies, kept them impassive but took away their

true, about the fact that Epicurus was aware of the contents of *Physics* VI[172]. Nevertheless, some scholars (such as Furley[173], Long and Sedley[174]) believe that Epicurus did develop a theory which was meant to overcome Aristotle's objections, whereas others (such as Laks[175]) criticise this view as too simplistic. The truth of the matter, presumably, lies in the middle, as Rashed has convincingly argued[176]: Epicurus retained some elements of Aristotle's criticisms, while, at the same time, developing a theory which was first of all meant to be in agreement with the internal constraints of his overall philosophical system.

1.3.4.2. Themistius

Themistius' paraphrase is, here as in the case of *Physics* V.3, quite faithful to Aristotle's text. Yet, two innovative elements can be underlined. The first is the addition of a new argument in support of Aristotle's first argument of the chapter, concerning the case, in particular, of points and lines. Themistius remarks:

> Again, if a magnitude consists of partless things, then it is possible for one line to have become greater than another by a [single] point. But if so, the point will be divided into two; for if every line is divisible into two, then so too are the [lines] that are greater and less by a [single] point. So when the greater line is cut into two, the point will also be cut into two[177].

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partlessness, since it was on this account that they were challenged by Aristotle" (cf. SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor posteriores commentaria*, ed. DIELS, *op. cit.*, 925.18-22, translation taken from SIMPLICIUS, *On Aristotle* Physics *6*, KONSTAN (trans.), *op. cit.*, p. 17). Simplicius account, however, is certainly not accurate in its doctrinal presentation. Indeed, as seen above, even if one were to agree that the arguments of *Physics* VI.1 can be taken, at least primarily, as applying only to unextended indivisible entities (and I do not see how this would be possible for the second of them), still those put forth, for instance, in *De generatione* I.8 are beyond doubt addressed primarily against extended atoms, and even based on the assumption that all extended magnitudes are fundamentally similar from an ontological point of view.

[172] Contrary to more traditional interpretations, such as that of E. BIGNONE, *L'Aristotele perduto e la formazione filosofica di Epicuro (2 vols.)*, Firenze, La Nuova Italia 1936, now available in Bompiani's *Il pensiero occidentale* collection (2007 edition).

[173] FURLEY, *Two Studies in the Greek Atomists*, *op. cit*.

[174] A.A. LONG, D. SEDLEY, *The Hellenistic Philosophers (2 vols.)*, Cambridge, Cambridge University Press, 1988, esp. vol. 1, pp. 51-52.

[175] A. LAKS, *Épicure et la doctrine aristotélicienne du continu*, in F. DE GANDT, P. SOUFFRIN (eds.), *La* Physique *d'Aristote et les conditions d'une science de la nature (Bibliothèque d'histoire de la philosophie)*, Paris, Vrin, 1991, pp. 181-194.

[176] Cf. ALEXANDRE D'APHRODISE, *Commentaire perdu à la* Physique *d'Aristote (Livres IV-VIII)*, ed. RASHED, *op. cit*., pp. 356-358.

[177] THEMISTIUS, *On Aristotle* Physics *5-8*, TODD (trans.), *op. cit.*, p. 41. For the Greek text see THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, *op. cit.*, 182.24-28: "ἔτι εἰ μέγεθος ἐξ ἀμερῶν, καὶ γραμμὴν μείζω σημείῳ γραμμῆς δυνατὸν γενέσθαι, ἀλλ᾽εἰ τοῦτο, δίχα διαιρεθήσεται τὸ σημεῖον. εἰ γὰρ

The argument, which is followed by an analogous one concerning the halving of a circle, and which will have an important posterity in the Medieval discussion of continuity, is remarkable for the conception of indivisibles that it presupposes. Indeed, if the addition of an indivisible to a line can make it greater, the 'indivisible' which Themistius has in mind is not an unextended point merely interpreted as the limit of a line, as it was in Aristotle. Themistius seems here to be thinking to physical atoms, rather than geometrical points[178]. While this is problematic (the argument, after all, is taken as a purely mathematical one, insofar as it applies to points in a line), I believe that this passage (as it was the case with Alexander) can be taken as evidence of the fact that the whole reasoning of Aristotle in *Physics* VI.1 was interpreted in Late Antiquity as a criticism against Leucippus' and Democritus' atomism.

The other innovative passage of Themistius' paraphrase of *Physics* VI.1, one which has commanded the attention of scholars for its historical relevance, concerns the

πᾶσα γραμμὴ δίχα διαιρετή, καὶ ἡ μείζων σημείῳ καὶ ἡ ἐλάττων. ὅταν τοίνυν ἡ μείζων τέμνηται δίχα, καὶ τὸ σημεῖον δίχα τμηθήσεται." The argument (together with the analogous one concerning circles which immediately follows it, albeit referring it to their circumference, rather than their area, as in Themistius) is also quoted by Simplicius (cf. SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor posteriores commentaria* Simplicius, ed. DIELS, *op. cit.*, 930.35-931.6), which attributes it to Eudemus, so that the text (in Simplicius' version) is also included in the anthology of Eudemus' fragments published as F. WEHRLI (ed.), *Eudemos von Rhodos (Die Schule des Aristoteles: Texte und Kommentar, Heft viii)*, Basel, Schwabe, 1955, as fr. 100. Themistius' choice to quote the argument without referring it to Eudemus might be due to his general reluctance to quote his predecessor (Todd, the translator of Themistius' paraphrase, notes that he only mentions Eudemus once in the whole text, namely at 119.26, while commenting on *Physics* IV.5 (cf. THEMISTIUS, *On Aristotle* Physics *5-8*, TODD (trans.), *op. cit.*, p. 110, n. 213). It is useful to note in this context that this argument (probably originating from the discussion concerning fr. 1 of Zeno of Elea, which deals with the issue of finite parts of a line building an infinite one) had a long posterity both in the Medieval Arabic and Latin traditions. In particular, as it will be mentioned below in the following section, it is used by Averroes, but also by Al-Ghazālī and, in the 14th century, it is mentioned and (tentatively) refuted by Latin atomistic thinkers such as Nicholas of Autrecourt and Nicholas Bonet, and discussed by other thinkers as well, such as, most prominently, John Buridan. For this aspect, see esp. C. GRELLARD, *Les présupposés méthodologiques de l'atomisme: la théorie du continu de Nicolas d'Autrécourt et Nicolas Bonet*, ID. (ed.), *Méthodes et statut des sciences à la fin du Moyen Âge*, Lille, Presses universitaires du Septentrion, 2004, pp. 181-199, esp. pp. 183-184.

[178] This is probably the reason why, in subsequent stages of the discussion of this argument, and, notably, in 14th-century Latin atomistic thinkers such as Autrecourt and Bonet, the refutation of the argument provided is *physical*, rather than *mathematical*, and why, on the contrary, Buridan takes this argument as clearly showing that geometry, contrary to natural science, must necessarily presuppose the infinite divisibility of the continuum (see GRELLARD, *Les présupposés méthodologiques de l'atomisme: la théorie du continu de Nicolas d'Autrécourt et Nicolas Bonet*, *op. cit.*, for a fuller discussion of all these aspects and their implications, more generally, for the confusion sometimes arising between mathematics and natural philosophy in 14th-century atomistic debates, what Grellard qualifies as a "categorial mistake", an "*erreur catégorielle*").

insertion of Epicurus' atomism (taken as a response to Aristotle) in the discussion of the second argument:

> But the 'quite brilliant' Epicurus is not ashamed to employ a drug harsher than the sickness, although Aristotle had previously demonstrated here too the faultiness of the argument. For, says [Epicurus], while something that is moving does move over the whole [line] ABC, it is not the case that it is moving but that it has moved over each of the partless things from which [ABC] is composed. Next, he is unaware of falling into innumerable absurdities: (i) because he constructs the motion over the whole of ABC not from motions but from the limits of motion and from the [fact of something] having moved; for the whole motion DEF will not have the parts D and E and F as its motion; for it is assumed that at each of these [parts] it is not moving but has moved; (ii) because he says that 'having moved' is true for the [extension] over which 'is moving' has never been true; and that 'having traversed' holds of the [extension] over which the present was never true. Again, if, when so disposed, everything that is naturally disposed to move is necessarily either moving or at rest, then <if> X is not moving at A, clearly it is at rest in A, and in the same way in both B and C. But it is also posited as moving over the [line] composed of ABC, so that while being at rest at every part of the [line] ABC, it will nonetheless traverse the whole [line]. In general, if motion over each of the partless [parts of a line] is going to hold of X, surely it will move when it undergoes motion? But if it is rest rather than motion that is going to hold of it, then its motion will be composed of rest![179].

According to Themistius, Epicurus, reminiscent of Aristotle's argument against Leucippus' and Democritus' atomism, tried to avoid it by positing that motion over the "partless things" out of which space is composed (i.e., ἐλάχιστα) occurs instantaneously. The idea presented in the passage seems to be that every motion over such ἐλάχιστα occurs at an instant of time, rather than an extended period of time. Thus, the time required by a motion does not depend on the time required to traverse the distance covered throughout that motion, rather, it depends on the time of rest of the moving body between

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[179] THEMISTIUS, *On Aristotle* Physics *5-8*, TODD (trans.), *op. cit.*, p. 43. For the Greek text see THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, *op. cit.*, 184.9-28: "ἀλλ᾽ὁ σοφώτατος ἡμῖν Ἐπίκουρος οὐκ αἰσχύνεται χρῆσθαι φαρμάκῳ τῆς νόσου χαλεπωτέρῳ καὶ ταῦτα Ἀριστοτέλους τῆν μοχθηρίαν τοῦ λόγου προεπιδείξαντος. ἐπὶ μὲν γὰρ τῆς ὅλης τῆς ΑΒΓ κινεῖται, φησί, τὸ κινούμενον, ἐφ᾽ἑκάστου δὲ τῶν ἀμερῶν, ἐξ ὧν σύγκειται, οὐ κινεῖται, ἀλλὰ κεκίνηται· εἶτ᾽οὐκ αἰσθάνεται περιπίπτων ἀναριθμήτοις τισὶν ἀτοπίαις, πρῶτον μέν, ὅτι τὴν κίνησιν τὴν ἐφ᾽ὅλης τῆς ΑΒΓ συντίθησιν οὐκ ἐκ κινήσεων, ἀλλ᾽ἐκ περάτων κινήσεως καὶ τοῦ κεκινῆσθαι· ἡ γὰρ ὅλη κίνησις ΔΕΖ οὐχ ἕξει κίνησιν τὰ μόρια, τὸ Δ καὶ τὸ Ε καὶ τὸ Ζ (κεῖται γὰρ οὐ κινεῖσθαι καθ᾽ἑκάστην τούτων, ἀλλὰ κεκινῆσθαι)· ἔπειθ᾽ὅτι τὸ κεκινῆσθαί φησιν ἀληθές, ἐφ᾽οὗ μηδέποτε τὸ κινεῖσθαι γέγονεν ἀληθές, καὶ τὸ διεληλυθέναι ὑπάρχειν, ᾧ μὴ πρότερον τὸ διιέναι, καὶ τὸ βεβαδικέναι, ᾧ μὴ πρότερον τὸ βαδίζειν, καὶ ὅλως τὸ παρῳχμένον ἀληθές, οὗ τὸ ἐνεστὼς οὐδέποτ᾽ἦν ἀληθές. ἔτι δὲ εἰ πᾶν τὸ κινεῖσθαι πεφυκός, ὅτε πέφυκεν, ἤτοι κινεῖται ἐξ ἀνάγκης ἢ ἠρεμεῖ, <εἰ> μὴ κινεῖται τὸ Ω κατὰ τὸ Α, δῆλον ὅτι ἠρεμεῖ ἐν τῷ Α, ὁμοίως δὲ καὶ ἐν τῷ Β, ὁμοίως δὲ καὶ ἐν τῷ Γ· ἀλλὰ καὶ κεῖται κινεῖσθαι ἐπὶ τῆς συγκειμένης ἐκ τῶν ΑΒΓ, ὥστε κατὰ πᾶν μέρος ἠρεμοῦν τῆς ΑΒΓ πᾶσαν οὐδὲν ἧττον διήξει. ὅλως δὲ εἰ μὲν ἐφ᾽ἑκαστου τῶν ἀμερῶν κίνησις ὑπάρξει τὸ Ω, πῶς ἔχον κίνησιν οὐ κινήσεται; εἰ δ᾽οὐχ ὑπάρξει κίνησις, ἀλλ᾽ἠρεμι1α, ἐξ ἠρεμίας ἡ κίνησις συντεθήσεται."

the instantaneous motions over each of the ἐλάχιστα it traverses. Themistius observes, however, that this strategy cannot really avoid Aristotle's argument. Indeed, first of all, Epicurus' instantaneous motions are not 'motions' properly speaking, but rather only limits of motion. Secondly, there is no time at which we can say that a body is moving over a given magnitude, so that, as Aristotle remarked, it is never true, in this scenario (as in Leucippus' and Democritus' original one), that a body is moving over a magnitude, while it is true that it has moved over that magnitude, something which is a plain contradiction. Themistius' reply, while ingenuous, is of course open to objections, but all these objections depend on the conception of 'instantaneous motion' one chooses to adopt. It is extremely interesting to see that such a debate emerged in the context of 14th-century Latin discussions on the continuity of motion independently (as far as it can be determined at the present state of research) from the Late Ancient one concerning Epicurus' doctrine of instantaneous motion.

1.3.4.3. Philoponus

Turning now to Philoponus, it seems quite clear from the extant evidence that his commentary on *Physics* VI.1-2 resents both of the orthodox Peripatetic exegesis evident in Alexander's *scholia* and, even more, of Themistius' commentary. Yet, the brevity of the commentary does not allow to present new elements in the context of this discussion[180], and, what is more, there is no explicit reference to Epicurus, something

[180] There is only one exception, which is represented by the fact that Philoponus explicitly states what has been called, in the opening section of this chapter, the "isomorphism thesis" according to which, for Aristotle, what holds for magnitude also holds for motion and for time (with special reference to continuity). Philoponus, in the context of commenting on the second argument of *Physics* VI.1, and, more specifically, on the section 231b18-232a17, remarks the following: "He [i.e., Aristotle] has explained in the fourth book [cf. *Physics* IV.11, 219a10 ff. and 220a4 ff.] that for magnitude, motion along that magnitude, and time, all properties which hold for one of them, hold for the others, namely properties such as divisibility and continuity. If magnitude is continuous, then the motion along it and the time which measures that motion are also continuous. If magnitude is divisible, then time and motion are also divisible" (cf. ARISṬŪṬĀLĪS, *al-Ṭabīʿa. Tarjamat Isḥāq ibn Ḥunayn maʿa šurūḥ Ibn al-Samḥ wa Ibn ʿAdī wa Mattā ibn Yūnus wa Abī l-Faraj ibn al-Ṭayyib*, ed. BADAWI, *op. cit.*, 613.7-11; the translation is taken from PHILOPONUS, *On Aristotle* Physics *5-8*, with SIMPLICIUS, *On Aristotle on the Void*, LETTINCK, URMSON (trans.), *op. cit.*, p. 77). The isomorphism thesis is, however, explicitly mentioned in this context also by Simplicius, who remarks, concerning magnitude, motion and time, that "[…] [e]ither all of them alike are composed of indivisibles and are divided into indivisibles or none of them is" (SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor posteriores commentaria*, ed. DIELS, *op. cit.*, 932.6-7: "[…] ἢ ἐξ ἀδιαιρέτων σύγκειται πάντα καῖ διαιρεῖται εἰς ἀδιαίρετα ἢ οὐδὲν αὐτῶν" ; translation taken from SIMPLICIUS, *On Aristotle* Physics *6*, KONSTAN (trans.), *op. cit.*, p. 25).

which, in all likelihood, was part of the original Greek text of the commentary, yet had not been deemed worthy of being included in the Arabic paraphrase of it.

1.3.4.4. Simplicius

Simplicius' commentary on *Physics* VI.1-2 is focused on providing an extremely careful reconstruction of Aristotle's arguments, one which cannot find place in this chapter. Nevertheless, he, as well as his predecessors, inserts some innovative elements in the discussion. One of them (one which is particularly relevant for this thesis) concerns the mention of the Epicureans in connection with Aristotle's second argument, which therefore joins Alexander's *scholium* and Themistius' passage on the same subject. Simplicius' text is the following:

> That he [i.e., Aristotle] did not pose this objection [namely, that motion over a finite distance can occur without having moved over any of the parts of that distance] as an entirely implausible [possibility] is indicated by the fact that, although [Aristotle] both posed it and thoroughly resolved it, nevertheless the Epicureans, who came later, say that motion occurs this way: for they say that magnitude, motion and time are [all] made of partless things, and that a moving thing does move over the whole magnitude that is constructed of partless things, but does not move along each of the partless things in it; rather, it has moved [along the partless things], because if it were posited that what is moving over the whole [magnitude] were moving over these [partless things] as well, they would be divisible[181].

Now, remarkably, in the passage (as in Alexander's *scholium*) Epicurus' (or better, the Epicureans') theory of motion is not distinguished from that of Leucippus and Democritus, contrary to what Themistius claims, namely that, at least in his own intention, Epicurus was trying to reply to Aristotle's criticism, and thus to produce a partially different theory from the one Aristotle was criticising[182]. Nevertheless, the reply

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[181] SIMPLICIUS, *On Aristotle* Physics *6*, KONSTAN (trans.), *op. cit.*, p. 28. For the Greek text see SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor posteriores commentaria*, ed. DIELS, *op. cit.*, 934.23-30: "ὅτι δὲ οὐ πάντῃ ἀπίθανον ταύτην τέθεικε τὴν ἔνστασιν, δηλοῖ τὸ καὶ θέντος αὐτὴν καὶ διαλύσαντος τοὺς περὶ Ἐπίκοθρον ὅμως ὕστερον γενομένους οὕτω λέγειν τὴν κίνησιν γίνεσθαι· ἐξ ἀμερῶν γὰρ καὶ τὸ μέγεθος καὶ τὴν κίνησιν καὶ τὸν χρόνον εἶναι λέγοντες ἐπὶ μὲν τοῦ ὅλου μεγέθους τοῦ ἐξ ἀμερῶν συνεστῶτος κινεῖσθαι λέγουσι τὸ κινούμενον, καθ᾽ἕκαστον δὲ τῶν ἐν αὐτῷ ἀμερῶν οὐ κινεῖσθαι, ἀλλὰ κεκινῆσθαι, διὰ τὸ εἰ τεθείη καὶ ἐπὶ τούτων κινεῖσθαι τὸ ἐπὶ τοῦ ὅλου κινούμενον διαιρετὰ αὐτὰ ἔσεσθαι."

[182] This might be due to the fact that, as Marwan Rashed suggests, Simplicius bases his passage on the corresponding one in Alexander's *Physics* commentary (cf. ALEXANDRE D'APHRODISE, *Commentaire perdu à la* Physique *d'Aristote (Livres IV-VIII)*, ed. RASHED, *op. cit.*, p. 356: "À part quelques variants infimes, cette scholie [i.e., the corresponding passage in Alexander's commentary] se retrouve chez Simplicius, *In*

to Epicurus and to his followers, for all three commentators, is the same: the Epicurean theory of instantaneous motions, however conceived, cannot escape Aristotle's argument. To reinforce this idea, Simplicius remarks (cf. 934.31-935.9) that it is both inherently contradictory that a body moving over a given distance is at rest (since it is not moving, according to the Epicureans) in any of its parts, because (as Aristotle had already remarked) it is inherently contradictory that something moves and is at rest at the same time in respect of the same thing. Moreover, he also concludes this section of his commentary by remarking (cf. 935.9-21) that, according to Aristotle, the Epicureans (as all the others who share the position attacked by Aristotle) also run in a dilemma, namely, that they have to assume that the parts of any motion are either motions or not motions. But, if they are motions, then a contradiction ensues, namely that what moves is at rest in them and moving at the same time. And, if they are 'not motions', then another contradiction ensues, namely, that motion is composed of 'not motions'.

As a final remark, it is interesting that none of the Late Ancient commentators whose commentary on *Physics* VI are extant gives any specific relevance to the "definition" of continuity as (potential) infinite divisibility provided by Aristotle in *Physics* VI.2, 232b22-23[183]. This shows quite clearly that Late Ancient commentators did not truly consider this an alternative definition of 'continuity', in addition to the one provided by Aristotle in *Physics* V.3 (or even the only true definition of continuity). Rather, they viewed it (correctly, I believe) as simply a natural restatement of the very strict connection (what I reconstructed as a co-implication) between continuity and (potential) infinite divisibility.

Phys. 934.23-30. Il est à peu près certain que celui-ci puise ses réflexions au commentaire de son prédécesseur").

[183] Neither Alexander's *scholia* nor Themistius' paraphrasis comment the passage, while Philoponus simply remarks that "the continuous is that which is always divisible into things which are [here it occurs a 'not' to be expounded] divisible" (cf. ARISṬŪṬĀLĪS, *al-Ṭabī'a. Tarjamat Isḥāq ibn Ḥunayn ma'a šurūḥ Ibn al-Samḥ wa Ibn 'Adī wa Mattā ibn Yūnus wa Abī l-Faraj ibn al-Ṭayyib*, ed. BADAWI, *op. cit.*, 624.6-7; the translation is taken from PHILOPONUS, *On Aristotle* Physics *5-8*, with SIMPLICIUS, *On Aristotle on the Void*, LETTINCK, URMSON (trans.), *op. cit.*, p. 81), and Simplicius says that "[…] ἀφορίζεται τὸ συνεχὲς ὅτι τὸ διαιρετόν ἐστιν εἰς ἀεὶ διαιρετά" ("[...] he [i.e. Aristotle] specifies that the continuous is that which is 'divisible into forever divisibles'"; SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor posteriores commentaria*, ed. DIELS, *op. cit.*, 942.29-30; translation taken from SIMPLICIUS, *On Aristotle* Physics *6*, KONSTAN (trans.), *op. cit.*, p. 36).

1.3.5. Philoponus' Commentary on the *De generatione*

Philoponus' commentary on *De generatione*, which the author presents as a report of Ammonius' teachings, together with some personal observations, is the only Late Ancient commentary on this Aristotelian treatise preserved[184]. In his commentary on *De*

[184] The Greek text of the commentary has been edited in the *Commentaria in Aristotelem Graeca* series as PHILOPONUS, *Ioannis Philoponi in Aristotelis libros De generatione et corruptione commentaria (Commentaria in Aristotelem Graeca XIV, Pars II)*, ed. H. VITELLI, Berlin, Reimer, 1897. An English translation (from which all quotations below are taken) has appeared in the *Ancient Commentators on Aristotle* series, in three volumes: PHILOPONUS, *On Aristotle* On Coming-to-Be and Perishing *1.1-5*, C.J.F. WILLIAMS (trans.), S. BERRYMAN (introduction), London, Duckworth, 1997; PHILOPONUS, *On Aristotle* on Coming-to-Be and Perishing *1.6-2.4*, C.J.F. WILLIAMS (trans.), S. BERRYMAN (introduction), London, Duckworth, 2001, and PHILOPONUS, *On Aristotle* On Coming-to-Be and Perishing *2.5-11*, I. KUPREEVA (trans.), London, Duckworth, 2005. It should be noted that, although there is no extant Latin translation of Philoponus' commentary on the *De generatione* dating to the 13th or to the 14th century, at least some portions of it might have been circulating in the Latin world already in the 12th century. Indeed, Rega Wood and Michael Weisberg have recently remarked that "[b]rief excerpts from Philoponus's commentary [on the *De generatione*] translated at the end of the twelfth century – such as, 'ut mel, ut huic dulce huic amarum' – appear as glosses in Oxford, Bodleian Library, Seldon supra 24" (R. WOOD, M. WEISBERG, "Interpreting Aristotle on Mixture: Problems about Elemental Composition from Philoponus to Cooper", *Studies in History and Philosophy of Science* 35, 2004, pp. 681-706, p. 684, n. 5). Yet, Wood and Weisberg themselves seem to be convinced that, apart from such limited glosses, the commentary was virtually absent from the Medieval Latin world. To this commentary it should also be added a commentary on *De generatione* II.2-5 by Alexander of Aphrodisias, lost in Greek but identified by Silvia Fazzo and Emma Gannagé in some manuscripts of the Arabic *Kitāb al-Tasrīf* (*Book of Morphology*) by Jabir ibn Hayyan, an early alchemical work, critically edited in Emma Gannagé's doctoral thesis as E. GANNAGÉ, *Le commentaire d'Alexandre d'Aphrodise* In de generatione et corruptione *perdu en grec retrouvé en Arabe dans Gabir ibn Hayyan* Kitāb al-Tasrīf*: édition, traduction annotée et commentaire*, Ph.D. thesis, Paris, Université Paris I Panthéon-Sorbonne, 1998, on the basis of three manuscripts (ms. Paris, BnF, Ar. 5099, ff. 128b1-147b21, Teheran, Dāneshgāh-e, Kētab-khāna-ī Markazī 491, ff. 151b20-177a21, and ms. Teheran, Ketābkhāne-ye Mellī-ye Malek 6206, pp. 247,17-286,17) and translated in English as ALEXANDER OF APHRODISIAS, *On Aristotle* On Coming-to-Be and Perishing *2.2-5*, E. GANNAGÉ (trans.), P. ADAMSON (guest editor) London, Duckworth, 2005 (on this text, a complete account of its rediscovery, including the full extent of Silvia Fazzo's contribution, not properly acknowledged by Gannagé, and a critical assessment of Gannagé's edition, see especially S. FAZZO, "Frammenti da Alessandro di Afrodisia *In De generatione et corruptione* nel *Kitāb al-Tasrīf*: problemi di riconoscimento e di ricostruzione", *Documenti e studi sulla tradizione filosofica medievale* X, 1999, pp. 195-203, now, in an updated version, in EAD., Alexander Arabus. *Studi sulla tradizione araba dell'aristotelismo greco (il giogo 87)*, Pistoia, Petite Plaisance, 2018, pp. 145-161, and also EAD., *Alessandro di Afrodisia sulle 'contrarietà tangibili' (*De gen. et corr. *II.2): fonti greche e arabe a confronto*, in C. D'ANCONA, G. SERRA (eds.), *Aristotele e Alessandro di Afrodisia nella tradizione araba*, Padova, Il Poligrafo, 2002, pp. 151-189). Since this commentary, however, does not cover Book I of *De generatione*, it will not be considered in the present thesis. In addition to these sources, it should also be mentioned that a separate treatise by Alexander of Aphrodisias, usually quoted with the Latin title of *De mixtione*, is extant in Greek. While it is not specifically a commentary on the *De generatione*, it explains at length Aristotle's doctrine of mixture as presented in *De generatione* I.10, and it defends it against Stoic views on the same topic. The treatise has been critically edited as ALEXANDER APHRODISIENSIS, *Alexandri Aphrodisiensis praeter commentaria scripta minora: Quaestiones, De fato, De mixtione (Supplementum Aristotelicum II.2)*, ed. I. BRUNS, Berlin, Reimer, 1892, although a new critical edition has been clearly shown to be necessary since, at least, E. MONTANARI, "Per un'edizione del *Περὶ Κράσεως* di Alessandro di Afrodisia", *Atti e memorie dell'Accademia Toscana di Scienze e Lettere 'La Colombaria'* XXXVI, 1971, pp. 17-58. An English translation, after a complete translation in German and some partial translations in English, has appeared as R.B. TODD, *Alexander of Aphrodisias on Stoic Physics. A Study of the* De mixtione *with Preliminary*

generatione I.2 Philoponus (who explicitly claims to be mostly reporting Ammonius' teachings, with some personal additions) provides a careful reconstruction of the "atomistic dilemma" discussed in the previous section. His interpretation stresses (probably more than it is needed) the opposition between a simultaneous and a successive division of a given magnitude. Philoponus remarks (giving great importance to Aristotle's claim at 316b21 that the simultaneous infinite division of a magnitude, even merely conceptually, is impossible) that the division of a magnitude at a given point will make it impossible to simultaneously divide it at the point "immediately next" to it, something which is, indeed, at the centre of Aristotle's reasoning, as it has been remarked above. Nevertheless, there is no reason why this remark should not also extend to successive divisions, and it is this "limit" that also vitiates Philoponus' analysis of Aristotle's final reply to the dilemma, the one contained in *De generatione* I.2, 316b34-317a11. The solution, it should be recalled, insists exactly on the fact that, however a given magnitude is divided (be it simultaneously or successively) by actualising a certain point in it through division at that point it becomes impossible to actualise the point "immediately next" to it, so that the magnitude is never infinitely divided, although it can be divided anywhere, i.e., at any point in it, and, as such, it is potentially infinitely divisible. Philoponus, however, insists on the importance of the simultaneity of the process of division referred to by Aristotle, by remarking that:

> Once again he [i.e., Aristotle] sets out the different meanings of the expression 'everywhere divisible'. He says that one of the things meant cannot possibly exist, while the other can. Being 'everywhere divisible', he says, 'in one sense belongs to things possessed of size' and in another it does not. It does not belong – and it is by understanding it in this sense that Democritus constructs his *reductio ad absurdum* – in the sense of being divisible everywhere simultaneously. This is impossible, he says, for the reason that there is no point contiguous with another point. Aristotle takes this to be evident[185].

Essays, Text, Translation and Commentary (Philosophia Antiqua XXVIII), Leiden, Brill, 1976. Since, however, also in this case the treatise does not cover *De generatione* I.2 and *De generatione* I.8, and, more generally, it does not present significant remarks on the topics of relevance to my discussion, it will not be discussed in this thesis.

[185] PHILOPONUS, *On Aristotle* On Coming-to-Be and Perishing *1.1-5*, WILLIAMS (trans.), BERRYMAN (introduction), *op. cit.*, p. 62. For the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis libros De generatione et corruptione commentaria*, ed. VITELLI, *op. cit.*, 39.17-24: "καὶ πάλιν τῆς 'πάντῃ διαιρετόν' φωνῆς διάφορον ἐκτίθεται τὸ σημαινόμενον, και φησιν ὅτι τὸ μὲν τῶν σημαινομένων ἀδύνατον συστῆναι τὸ δὲ δυνατόν· τὸ γὰρ πάντῃ, φησί, διαιρετὸν ἔστι μὲν ὡς ὑπάρχει τοῖς μεγέθεσιν, ἔστι δὲ ὡς οὐχ ὑπάρχει· οὐχ ὑπάρχει μέν, ὡς Δημόκριτος ἀκούσας εἰς ἄτοπον ἀπήγαγε τὸν λόγον, κατὰ τὸ ἅμα πάντῃ

As a result of his unwarranted insistence, Philoponus, in what follows, is forced to interpret the 'everywhere' occurring at 317a9 as 'everywhere simultaneously' (cf. 40.24-26), and, in the same way, he glosses the passage at 317a10-12 ("For if it is divisible at the middle it will also be divisible at a contiguous point"), among other remarks, in the following way:

> But the text does not fully indicate what is meant. It would be clear and simultaneously the argument would be stated in full if what was said was 'If the continuum were divisible everywhere simultaneously in such a way that nothing of it was left undivided, being divided by bisection or in any other way, it would be divided also at a contiguous point'[186].

Apart from this tension inherent in Philoponus' interpretation, his understanding of the text clearly points towards the interpretation of the Aristotelian chapter provided in the previous section.

For what concerns, instead, *De generatione* I.8, Philoponus, in commenting the argument mentioned in the previous section according to which it is absurd, for atomists, to claim that indivisibility belongs (by nature) to some magnitudes but not to others, notes that those who, like Aristotle, admit infinite divisibility in potency but deny it in act, can claim that extremely small bodies, while always remaining undivided in act due to the weakness of the dividing agent[187], still are potentially divisible. This passage is the one,

διαιρετὸν εἶναι, τοῦτο δὲ ἀδύνατόν ἐστι, διότι, φησίν, οὔκ ἔστι στιγμὴ στιγμῆς ἐχομένη. λαμβάνει γὰρ τοῦτο Ἀριστοτέλης ὡς ἐναργές."

[186] PHILOPONUS, *On Aristotle* On Coming-to-Be and Perishing *1.1-5*, WILLIAMS (trans.), BERRYMAN (introduction), *op. cit.*, p. 64. For the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis libros De generatione et corruptione commentaria*, ed. VITELLI, *op. cit.*, 41.1-4: "ἐνδεῶς δὲ ἡ λέξις πέφρασται. εἴη δ᾽ἂν σαφὴς ἅμα καὶ τέλειος ὁ λόγος οὕτως εἰποῦσιν 'εἰ πάντῃ ἅμα διαιρετὸν ἦν τὸ συνεχὲς ὡς μηδὲν αὐτοῦ μένειν ἀδιαίρετον κατὰ μέσον ἢ καὶ ὁπωσοῦν ἄλλως διαιρεθέν, διῃρεῖτο ἂν καὶ κατ᾽ἐχομένην στιγμήν'."

[187] Here Philoponus, following Aristotle's lead in the chapter, is clearly thinking exclusively of a physical process of division, not of a conceptual one. Cf. PHILOPONUS, *On Aristotle* on Coming-to-Be and Perishing *1.6-2.4*, WILLIAMS (trans.), BERRYMAN (introduction), *op. cit.*, p. 80: "[...] so, while they are <all> divisible, it comes about that the big ones [i.e., bodies] are more divisible because they are more prone to collide with the objects which divide them, whereas the small ones escape the dividing object on account of their small size and slip away [...]." For the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis libros De generatione et corruptione commentaria*, ed. VITELLI, *op. cit.*, 175.16-18: "[…] διαιρετῶν οὖν ὄντων συμβαίνει τὰ μεγάλα μᾶλλον εἶναι διαιρετὰ διὰ τὸ προσπταίειν μᾶλλον τοῖς διαιροῦσι, τὰ μικρὰ δὲ ἐκφεύγει διὰ τὴν σμικρότητα τὸ διαιροῦν καὶ ἐξολισθαίνει [...]."

mentioned above, which helps to interpret Simplicius' use of the notion of "continuous atoms" in his commentary on *Categories* 6:

> If, he [i.e., Aristotle] says, atoms are indivisible by nature and not on account of their small size (for in that case they would not be atoms by nature; those who do not posit atoms do not divide them to infinity, but halt the division on account of smallness, not, though, maintaining that they are indivisible by nature, but that they are divisible in potentiality to infinity) – so if the atoms are assumed to be indivisible by nature, it would be ridiculous, he says, to suppose that the small one were not divided but the big ones were. For why should indivisibility belong to the small ones but not to the big ones, and what formula would account for this?[188].

It is clear from the passage that what Philoponus is here hinting at is the fact, evident from everyday experience, that any process of physical division of a magnitude stops at extremely small ones, which, however, in themselves remain (potentially) infinitely divisible. It is in this sense that the only specific limit to the physical divisibility of magnitudes which Philoponus (as Simplicius in his commentary on *Categories* 6) admits is one depending on the "technical limits" of dividing agents themselves. It is well above this limit, however (and, *a fortiori*, well above the conceptual one analysed by Aristotle in *De generatione* I.2), that Late Ancient commentators will build the doctrine of hylomorphic *minima* that will be the subject of the following chapters of the thesis.

[188] PHILOPONUS, *On Aristotle* on Coming-to-Be and Perishing *1.6-2.4*, WILLIAMS (trans.), BERRYMAN (introduction), *op. cit.*, p. 80. For the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis libros De generatione et corruptione commentaria*, ed. VITELLI, *op. cit.*, 175.7-14: "εἰ φύσει, φησίν, ἀδιαίρετα τὰ ἄτομα καὶ μὴ διὰ τὴν σμικρότητα (οὕτω γὰρ οὐκ ἂν εἶεν φύσει ἄτομα· καὶ γὰρ οἱ μὴ ἄτομα ὑποτιθέμενοι οὐκ εἰς ἄπειρον διαιροῦσιν, ἀλλ᾽ἱστᾶσι διὰ τὴν σμικρότητα τὴν τομήν, οὐ μέντοι φύσει ἀδιαίρετα αὐτὰ λέγουσιν, ἀλλὰ κατὰ δύναμιν ἐπ᾽ἄπειρον διαιρετά), εἰ τοίνυν φύσει ἀδιαίρετα ὑποτίθενται τὰ ἄτομα, ἀποκληρωτικόν, φησίν, ἂν εἴη μικρὰ μὲν ὑποτίθεσθαι μὴ διαιρεῖσθαι, μεγάλα δε. διὰ τί γὰρ καὶ κατὰ τίνα λόγον τοῖς μικροῖς μὲν ὑπάρχει τὸ ἀδιαίρετον, τοῖς δὲ μεγάλοις οὔ;" Interestingly, Aristotle himself mentions an analogous idea of the indivisibility of continuous entities when he speaks, in *Metaphysics* Δ.6 1016a17-19, of entities which are "indivisible by sense perception", while explaining the second sense of *per se* unity. The fact that these *minima* are still quantitatively divisible is remarked by Alexander in his commentary on this passage (cf. ALEXANDER APHRODISIENSIS, *Alexandri Aphrodisiensis in Aristotelis Metaphysica commentaria*, ed. HAYDUCK, *op. cit.*, 364.18-23).

1.4. Averroes on the Continuity of Magnitudes and on Their (Potential) Infinite Divisibility

1.4.1. A Premiss: *Kalām* Atomism and Its Critique in the *Falsafa*

As I will do later in the chapter concerning Medieval Latin commentators, I do not aim here to provide anything even remotely link a general overview of the Medieval debate on the continuity of magnitudes and of their (potential) infinite divisibility in the Islamic world. Rather, given the fact that the thesis focuses on the Latin world, I have chosen to limit my discussion in respect to the Islamic debate to Averroes' (1126-1198) doctrine of the continuity of magnitudes and of their (potential) infinite divisibility[189]. This is certainly due to the intrinsic relevance of this discussion, but also to the fact that it was the only one from the Islamic world to exert a significant influence on Medieval Latin Aristotelian commentators[190]. To this, it should also be added that only Averroes' doctrine of *minima naturalia*, among those available in the Islamic world (including Avicenna's one), exerted a direct influence on the Medieval Latin debate on *minima*. More in general, as I will show in Chapters 3 and 4, Averroes was the only commentator from the Islamic world on whom Medieval Latin commentators relied in the debate on *minima sensibilia*, focusing specifically on his *Long Commentary* on the *Metaphysics*.

Nevertheless, if Averroes' doctrine of the continuity of magnitudes and of their (potential) infinite divisibility is to be properly understood, a few words are in order concerning the wider context of such a theory. Indeed, as I have shown in the previous section, already Late Ancient Aristotelian commentators had to broaden their discussion, when considering the issue of the continuity of magnitudes and, especially, of their

[189] Note, however, that many important considerations concerning additional ways in which Islamic texts and topics influenced Medieval Latin commentators will be discussed in the following part of the chapter.
[190] Not, however, the only one that was known to Medieval Latin Aristotelian commentators. Not only, indeed, Latin commentators were also aware of al-Ghazali's anti-atomistic arguments (cf. Chapter 2), but they were also familiar with Avicenna's discussion of atomism and of continuity (at least since the end of the 13th century), thanks to the translation (albeit incomplete, and presumably only enjoying a limited circulation) of the relevant part of the *Kitāb al-Shifā'* dealing with it, namely, the third tractate of the first book of *al-Shifā*'s *Physics*, loosely corresponding to the contents of Aristotle's own *Physics* (cf. AVICENNA, *Avicenna Latinus: Liber Primus Naturalium, Tractatus tertius, De his quae habent naturalia ex hoc quod habent quantitatem*, ed. J. JANSSENS, Leuven, Peeters, 2017; for the date of the Latin translation of the text, probably to be situated between 1275 and 1280, although part of the first chapter had already been translated at the end of the 12th century, cf. *ibid.*, pp. 2*-3*). For the example of an anti-atomistic (geometrical) argument employed by Avicena that might have influenced an argument used by a Medieval author in his discussion of the continuity of magnitudes and of their (potential) infinite divisibility see below in this same chapter the section devoted to John Duns Scotus' *Ordinatio*.

(potential) infinite divisibility, so as to be able to attack a new form of atomism supposedly invulnerable to Aristotle's criticisms against Democritean atomism, namely, Epicurean atomism. Remarkably, a version of atomism significantly similar to the Epicurean one (but possibly having a very different origin), that is, a version of atomism based on conceptually – not merely "physically" – indivisible (insofar as "minimally extended") parts also emerged in the Islamic world, where it became predominant among *Kalām* theologians[191]. Such version of atomism was prominently opposed by Avicenna (ca. 970-1037), relying both on "physical" and on mathematical (specifically, geometrical) arguments (a distinction that, as I will show below, will also feature importantly in Averroes' discussion). Avicenna's criticism of *Kalām* atomism marked an important step in the Islamic debate on atomism and continuity. Morever, even Avicenna's positive belief in the continuity of magnitudes and in their (potential) infinite divisibility, and particularly the arguments adduced in support of such a belief, proved influential in the subsequent debate on atomism and continuity in the Islamic world[192]. It is exactly in the "post-Avicennian" space that Averroes' doctrine of the continuity of magnitudes and of their (potential) infinite divisibility can be meaningfully situated, although, as I will show below, in none of the texts I discuss does Averroes directly address a version of *Kalām* atomism, that, therefore, remains only part of the background of Averroes' discussion.

[191] For classical introductions to *kalām* atomism, see S. PINES, *Beiträge zur islamischen Atomenlehre*, Berlin, Heine, 1936, H.A. WOLFSON, *The Philosophy of the* Kalām, Cambridge, MA, Harvard University Press, 1976, ch. VI, C. BAFFIONI, *Atomismo e antiatomismo nel pensiero islamico (Series minor, Istituto universitario orientale di Napoli, Seminario di studi asiatici, 16)*, Roma, Herder, 1982, and A. DHANANI, *The Physical Theory of Kalām: Atoms, Space, and Void in Basrian Mu'tazilī Cosmology (Islamic Philosophy, Theology and Science: Texts and Studies 14)*, Leiden, Brill, 1994. For more updated introductions see A.I. SABRA, Kalām *Atomism as an Alternative Philosophy to Hellenizing* Falsafa, in J.E. MONTGOMERY (ed.), *Arabic Theology, Arabic Philosophy, From the many to the One: Essays in Celebration of Richard M. Frank*, Leuven, Peeters, 2006, pp. 199-272, and ID., "The Simple Ontology of *Kalām* Atomism: An Outline", *Early Science and Medicine* 14 (1/3), 2009, pp. 68-78.

[192] For some remarks on the later history of the confrontation between the traditions of *Kalām* and *falsafa* on atomism at the time of Avicenna and for the later impact of his criticism of *Kalām* atomism, see A. DHANANI, "The Impact of Ibn Sīnā's Critique of Atomism on Subsequent *Kalām* Discussions of Atomism", *Arabic Sciences and Philosophy* 25 (2015), pp. 79-104, and J. MCGINNIS, "A Continuation of Atomism: Shahrastānī on the Atom and Continuity", *Journal of the History of Philosophy* 57 (4) (2019), pp. 595-619. For a specific introduction, finally, to Ash'arite atomism, see R.M. FRANK, *Bodies and Atoms: The Ash'arite Analysis*, in M.E. MARMURA (ed.), *Islamic Theology and Philosophy. Studies in Honor of George F. Hourani*, Albany, NY, State University of New York Press, 1984.

1.4.2. Averroes' Doctrine

The discussion of the continuity of magnitudes and of their (potential) infinite divisibility by Averroes in his various Aristotelian commentaries is an extended and very important one[193]. In what follows I will take into consideration the *Long Commentary*[194] on the *Metaphysics*, the *Epitome*[195] and the *Long Commentary*[196] on the *Physics*, and the

[193] Note that many important remarks on Averroes' theory of the continuity of magnitudes, based specifically on all the extant versions of his *Physics* commentaries, Arabic, Hebrew, and Latin, have been put forth in Ruth Glasner's already quoted recent and important monograph on Averroes' natural philosophy, which will be also referred to in the next chapter concerning the understanding of Averroes' doctrine of *minima naturalia* (cf. GLASNER, *Averroes' Physics: A Turning Point in Medieval Natural Philosophy*, *op. cit.*). This text certainly represents the fundamental reference point in secondary literature for the study of Averroes' doctrine of the continuity of magnitudes.

[194] The Arabic version of the *Long Commentary* has been edited as IBN RUŠD, *Tafsīr mā ba'd aṭ-ṭabī'at (3 vols.)*, texte arabe inédit établi par M. BOUYGES, Beirut, 1938-1952. Some modern translations of parts of this commentary exist: AVERROÈS, *Grand commentaire (Tafsir) de la* Métaphysique*, Livre Bēta*, presentation et traduction de L. BAULOYE, Paris, Vrin, 2002; A. ELSAKHAWI, *Étude du livre Zāy (Dzēta) de la* Métaphysique *d'Aristote dans sa version arabe et son commentaire par Averroès*, Ph.D. thesis, Paris, Université Paris I Panthéon-Sorbonne, Lille, Atelier National de Reproduction des Thèses, 1994; AVERROÈS, *Grand Commentaire de la* Métaphysique *d'Aristote (Tafsīr mā ba'd aṭ-ṭabī'a), Livre Lām-Lambda*, traduit de l'arabe et annoté par A. MARTIN, Paris, Les Belles Lettres, 1984; C. GENEQUAND, *Ibn Rushd's Metaphysics. A translation with Introduction of Ibn Rushd's Commentary on Aristotle's* Metaphysics*, Book Lām,* Leiden, Brill, 1986. In addition to these translations, an Arabic-English translation of the commentary on Book Z, together with a philosophical commentary, has been announced by Matteo Di Giovanni (cf. M. DI GIOVANNI, *The Commentator. Averroes' Reading of the* Metaphysics, in GALLUZZO, AMERINI (eds.), *A Companion to the Latin Medieval Commentaries on Aristotle's* Metaphysics *(Brill's Companions to the Christian Tradition 43)*, Leiden, Brill, 2013, p. 63, n. 9). The Latin translation is available as AVERROES CORDUBENSIS, *Aristotelis Metaphysicorum libri XIIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metpahysicorum liber*, Venetiis 1562. The text, moreover, also contains the Latin translation of the *Epitome* on the *Metaphysics*. A Hebrew version, translated by Moshe ben Shlomo, is extant in manuscript form.

[195] The Arabic text has been edited as AVERROES CORDUBENSIS, *Epitome in Physicorum libros (Corpus commentariorum Averrois in Aristotelem, Series Arabica XX)*, ed. J. PUIG MONTADA, Madrid, Consejo Superior de Investigaciones Cientificas – Instituto Hispano-Árabe de Cultura, 1983. The Spanish translation, prepared by Puig Montada, has been published as AVERROES, *Epítome de Física (Filosofía de la naturaleza) (Corpus commentariorum Averrois in Aristotelem XX)*, J. PUIG MONTADA (trans.), Madrid, Consejo Superior de Investigaciones Cientificas – Instituto Hispano-Árabe de Cultura, 1987. A Hebrew translation by Moshe ibn Tibbon is also extant, and it has been edited in 1559 by Riva di Trento. The *Middle Commentary* on the *Physics* is preserved only in Hebrew, in various translations. For an introduction to the textual transmission of the commentary, see S. HARVEY, *Averroes on the Principles of Nature: The Middle Commentary on Aristotle's* Physics *I-II*, Ph.D. thesis, Cambridge, MA, Harvard University 1977.

[196] The Latin translation is available as AVERROES, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562. A critical edition of Book VII has recently appeared as AVERROES CORDUBENSIS, *Commentarium magnum in Aristotelis Physicorum librum septimum (Vindobonensis lat. 2334)*, ed. H. SCHMIEJA, Paderborn, Schöningh, 2007, based on the mentioned manuscript, which, however, significantly differs (at least for Books VII and textus 80-86 of Book VIII) from the text of the *editio Juntina*, thus pointing towards the existence of a second version of the Latin translation of the commentary. The Hebrew translation is preserved only in manuscript form. A separate work on the *Physics* by Averroes is a collection of questions, preserved only in Hebrew (save for *Questions* VI and VII, also extant in an Arabic manuscript) and recently edited as AVERROES, *Questions in Physics. From the Unpublished Sêfer* ha-derûšîn ha-tib'îyîm *(The New Synthese Historical Library. Texts*

Epitome[197] and *Middle Commentary*[198] on the *De generatione et corruptione*. I leave aside Averroes' *Middle Commentary* on *Categories* 6[199], and also the *Epitome*[200] and the *Middle Commentary*[201] on the *Metaphysics*, since these texts appear to be quite conservative for

and Studies in the History of Philosophy 39), H. TUNK GOLDSTEIN (ed. and trans.), Dordrecht, Kluwer, 1991.

[197] The *Epitome* is extant in the original Arabic, and also in Latin and Hebrew translation. The Arabic text has been critically edited, with a Spanish translation, as AVERROES, *Epitome del libro* Sobre la generación y la corrupción, J. PUIG MONTADA (ed. and trans.) Madrid, Consejo superior de Investigaciones Cientificas – Instituto Hispano-Árabe de Cultura, 1992. The critical edition of the Hebrew translation has been published together with the one of the *Middle Commentary* (see the following footnote).

[198] The *Middle Commentary* is extant in the original Arabic and both its Latin and Hebrew translations. The critical edition of the Arabic text has been published as AVERROES CORDUBENSIS, *Mittlerer Kommentar zu Aristoteles'* De generatione et corruptione *(Nordrhein-Westfälische Akademie der Wissenschaften und der Künste – Abhandlungen beider Klassen 111). Mit einer einleitenden Studie versehen, herausgegeben und kommentiert von* H. EICHNER, Paderborn, Schöningh, 2005. The Latin text has been edited as AVERROES CORDUBENSIS, *Commentarium Medium in Aristotelis De generatione et corruptione libros (Corpus Commentariorum Averrois in Aristotelem IV.1, versionum latinarum)*, ed. F.H. FOBES, S. KURLAND, Cambridge, MA, The Mediaeval Academy of America, 1956. The Hebrew text has been edited as AVERROES CORDUBENSIS, *Commentarium medium et epitome in Aristotelis* De generatione et corruptione *libros (Corpus commentariorum Averrois in Aristotelem IV.1-2, versionum hebraicarum)*, ed. S. KURLAND, Cambridge, MA, The Mediaeval Academy of America, 1958. An English translation of both the *Epitome* and the *Middle Commentary* has been published as AVERROES, *Averroes on Aristotle's* De generatione et corruptione*: Middle Commentary and Epitome (Corpus Commentariorum Averrois in Aristotelem IV.1-2, versio anglica)*, S. KURLAND (trans.), Cambridge, MA, The Mediaeval Academy of America, 1958.

[199] The *Middle Commentary* is extant both in the original Arabic text and in Latin and Hebrew translation. An English translation of it (and of Averroes' *Middle Commentary* on the *De interpretatione*) has been published as AVERROES, *Averroes' Middle Commentaries on Aristotle's* Categories *and* De interpretatione *(Princeton Legacy Library). Translated, with Notes and Introductions, by* C.E. BUTTERWORTH, Princeton, NJ, Princeton University Press, 1983 (a previous English translation, based, however, on a critical edition of the Arabic text superseded by the one used by Butterworth, and different in the fact that, for the commentary on the *Categories*, it also makes use of the Latin translation, is AVERROES, *Averroes' Middle Commentary on Porphyry's* Isagoge*, Translated from the Hebrew and Latin Versions, and on Aristotle's* Categoriae*, Translated from the Original Arabic and Latin Versions (Corpus Commentariorum Averrois in Aristotelem, vol. Ia, 1-2)*, H.A. DAVIDSON (trans.), Cambridge, MA, The Mediaeval Academy of America, 1969). The standard reference edition for the Latin translation of Averroes' *Middle Commentary* on the *Categories* is the first volume of the *editio Juntina II*: AVERROES CORDUBENSIS, *Aristotelis Stagiritae organum, quod logicam appelant, cum Averrois Cordubensis variis commentariis, epitome, quaesitis, ac epistola una. Hic accesserunt Levi Ghersonides in nonnullos Aristotelis et Averrois libros annotationes (...) et quorundam Arabum quaesita et epistola*, Venetiis, apud Junctas, 1562, Pars I. The critical edition of the Hebrew translation of Averroes' *Middle Commentary* on the *Categories*, together with that on Porphyry's *Isagoge*, has been published as AVERROES CORDUBENSIS, *Averrois Cordubensis commentarium medium in Porphyrii Isagoen et Aristotelis Categorias (Corpus Commentariorum Averrois in Aristotelem, Versionum Hebraicarum Ia)*, ed. H.A. DAVIDSON, Cambridge, MA, The Mediaeval Academy of America, 1969.

[200] A careful English translation, based on a close study of the manuscript witnesses of the work, has been published AVERROES, *On Aristotle's* Metaphysics*. An Annotated Translation of the So-called 'Epitome' (Scientia Graeco-Arabica 5/Averrois Opera Series A XXXV)*, R. ARNZEN (trans.), Berlin, de Gruyter, 2010. Two previous translations in German, based on less manuscripts, existed: one is AVERROES, *Die Epitome der* Metaphysik *des Averroes*, S. VAN DEN BERGH (trans.), Leiden, Brill, 1924, the other one is AVERROES, *Die* Metaphysik *der Averroes*, M. HORTEN (trans.), Halle, Niemeyer, 1912. The Arabic text has been edited as IBN RUŠD, *Rasā'il Ibn Rushd*, Hyderabad, 1946-1947.

[201] The *Middle Commentary* on the *Metaphysics* is extant only in Hebrew, in at least two translations dated to the end of the 13th century and the beginning of the 14th. A critical edition of them (together with an extensive textual and doctrinal study and an Italian translation of the commentary on the first two Books of

what concerns the relation between continuity and (potential) infinite divisibility (largely contrary to Late Ancient commentators).

Before any discussion of Averroes' doctrine of the continuity of magnitudes and of their (potential) infinite divisibility, a methodological premise concerning the general approach to Averroes' Aristotelian commentaries is in order. Recent research[202] has forced us to reconsider the traditional assumption that the epitomes (or short commentaries) represent a younger stage of Averroes' writings, whereas the middle commentaries are to be situated in the central years of his intellectual life and the long ones in his last years. Indeed, it has been demonstrated that, at least in some cases, Averroes kept revising (and even sometimes rewriting) substantial portions of the short, middle and long commentaries throughout his life, so that sometimes his most mature views are to be found, even concerning relevant issues, in the short or middle commentaries rather than in the long ones. This is especially the case for the *Metaphysics* and, even more so, for the *Physics*. In the case of the *Metaphysics*, we now know that, although it was originally composed around 1161, it was substantially revised twice, a first time arounde 1180 (therefore after the composition of the *Middle Commentary*, dated to 1174, but also revised afterwards) and a second one early during the 1990s (therefore almost contemporaneously to the composition of the *Long Commentary*, dated after 1190, but which itself underwent significant revisions). In the case of the *Physics*, we know that, while the *Epitome* was originally composed around 1159, it underwent significant revisions after 1186, therefore after the composition of the *Middle Commentary* (in 1169, but also revised afterwards) and that of the *Long Commentary* (composed in 1186, but probably the most revised work in the entire *corpus* of Averroes' commentaries on Aristotle). The situation is apparently simpler for the *De generatione*, where the *Epitome* can be dated to 1159 and the *Middle Commentary* to 1172, and also for the commentaries on the Categories (the short one dated to 1157 and the middle one presumably to 1164),

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the *Metaphysics*) has been recently published as M. ZONTA, *Il* Commento medio *di Averroè alla Metafisica di Aristotele nella tradizione ebraica. Edizione delle versioni ebraiche medievali di Zerahyah Hen e di Qalonymos ben Qalonymos con introduzione storica e filologica (2 vols.)*, Pavia, Pavia University Press, 2011. The work is extremely interesting for various reasons, not the least of them for the fact that Zonta provides clear evidence of revisions to the commentary on Δ.29 and Z (1045a7-1045b23) made by Averroes himself, based on a close study of the manuscript tradition. This finding thus parallels those made by Glasner concerning the revisions to the commentaries on the *Physics*.

[202] Cf. especially GLASNER, *Averroes' Physics. A Turning Point in Medieval Natural Philosophy*, *op. cit.*, especially pp. 28-40, but also, at least for what concerns the *Epitome* on the *Physics*, J. PUIG MONTADA, "Averroes y el problema de la eternidad del movimiento", *Ciudad de Dios* 212 (1), 1999, pp. 231-244.

but even in these cases the actual study of the manuscripts shows further layers of complexity.

Given this situation, attempting to provide a presentation of Averroes' doctrine of continuity based on the standard chronological succession of short, middle and long commentaries would appear too simplistic a criterion. Therefore, and given that the analysis of Averroes' texts, in the thesis, is merely aimed at a study of their reception in the Medieval Latin world, I have chosen to avoid entirely a chronological criterion and to follow the same systematic order of exposition adopted for Aristotle and for his Late Ancient commentators.

Let me first start with Averroes' *Long Commentary* on the *Metaphysics*. In the *Long Commentary* on the *Metaphysics* Averroes inserts some interesting remarks concerning continuity. Especially relevant is Averroes' *Long Commentary* on *Metaphysics* Δ.13, where Averroes notes that here Aristotle comes close to defining continuity in terms of (potential) infinite divisibility, yet retains a distinction between the two concepts, although he clearly claims that the former entails the latter:

> This speech can be [intended] almost as the dissolution of continuous and discrete quantities. Indeed, everything that is divided, is divided in things, which are naturally one. And one can understand discrete quantity as that which is divided in units which are naturally indivisible. Instead, continuous quantity is divided in units, but nevertheless [those units] are receptive of division[203].

The passage is reminiscent of the corresponding one quoted above in the commentary on *Metaphysics* Δ.13 attributed to Alexander of Aphrodisias. Nevertheless, Averroes goes further in an attempt to base the distinction between continuous and discrete quantities on the very concept of divisibility. In his understanding, indeed, the ultimate difference between continuous and discrete quantities is constituted by the fact that, while continuous quantities are divisible in parts that are always further divisible (according to a traditional Aristotelian reading), discrete quantities (here the example Averroes has in mind seems to be that of natural numbers) are those that can be divided to a unit, that is,

[203] AVERROES CORDUBENSIS, *Aristotelis Metaphysicorum libri XIIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metpahysicorum liber*, Venetiis 1562, f. 125rB-C: "Iste sermo potest esse quasi dissolutio continuae et discretae quantitatis. Omne nam quod dividitur, dividitur in res, quae naturaliter sunt unum. Et potest intelligere quantitatem discretam, quae dividitur in unitates indivisibiles naturaliter. Quantitas vero continua dividitur in unitates, sed tamen recipiunt divisionem."

something that is not further divisible. This passage, therefore, not only carries over the trend which I have evidenced in Late Ancient commentaries on the *Categories* and the *Metaphysics*, according to which the quantities resulting from the division of a continuous one are defined as discrete one with respect to the other, but it also brings it to its theoretical completion. Whether or not the process of division of a given quantity reaches something which is not (neither potentially nor actually) further divisible, is exactly the discriminating factor between continuous and discrete quantities.

Further innovative aspects of Averroes' doctrine of continuity emerge when one turns to the commentaries on the *Physics*. I discuss them together since Averroes' most significant innovations only feature in the *Long Commentary*, whereas the *Epitome* presents a largely traditional interpretive framework (at least concerning the passages I analyse), and it would therefore be unnecessary to devote a specific analysis to it.

Indeed, probably the only aspect in which the *Epitome* takes an original stance, in the commentary on *Physics* V.3, is to identify the notions of 'touching' and 'contiguity', contrary to what had been done by Late Ancient commentators (since Alexander), and therefore disposing of one of Aristotle's ambiguities in the text by entirely eliminating it. In the *Long Commentary*, instead, as I will show in a moment, not only Averroes thoroughly distinguishes 'touching' with 'contiguity', but, what is more, he also inserts an important subdivision within the notion of touching.

A preliminary aspect in which the two commentaries agree, however, is in suggesting an interpretation of 'being together in the same primary place' according to which two bodies can truly be said to be together in the same primary place only when there is nothing between them and their surfaces come to coincide. In this sense, 'being together in one primary place' ultimately reduces to 'touching' (and therefore, in the *Epitome*, also to 'contiguity'), or, better said, two bodies are touching (or even contiguous, according to the *Epitome*) when their extremities are together in the same primary place[204]. By taking this route, Averroes seems to adopt the same restrictive interpretation

[204] Cf. AVERROES, *Epitome de Fisica (Filosofía de la naturaleza)*, PUIG MONTADA (trans.), *op. cit*., p. 178: "El estar junto se dice de muchas maneras que se han enumerado en el libro de las *Categorías* [cf. *Cat.* 13, 14b25-15a12], pero solamente la primera en sentido propio, y es la que aquí se busca, cuando se dice de dos cuerpos que están juntos en su lugar primario (que es el límite del cuerpo que les circunda) sin que entre ellos quepa nada del cuerpo circundante ni afecte a la existencia tal de ambos cuerpos el que sus límites estén juntos y cubriéndose, pues los que se encuentran en este estado están en contacto", and AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 223rB-C: "Simul dicitur multis modis, ut dictum est in

of the notion put forth by Philoponus, while, at the same time, avoiding the extreme one adopted by Alexander, according to which 'being together in one primary place' is the same as being continuous.

When it comes to the analysis of the notion of touching itself, however, as said, the *Epitome* is rather silent, since it first discusses the notion of being in succession, and then simply remarks that "the contiguous [which is identical to the 'touching'] is that, beyond being in succession, [the things which are in succession] touch and meet each other". In the *Long Commentary*, however, Averroes first of all distinguishes in a principled way the notion of touching from that of contiguity. Indeed, there Averroes accepts the idea, already put forth by Alexander[205] and fundamentally shared by Simplicius, according to which only entities of the same species can be said to be contiguous (*sese* in the terminology adopted in the Medieval Latin translation of the commentary as reported in the *editio Juntina*), whereas other entities can only be said to be touching (to have a *contiguatio*, to keep to the same terminology, admittedly rather confusing, employed in the same translation – although entities touching are also sometimes referred to as *tangentia*). As Averroes puts it:

libro de *Predicamentis*: sed hic intendit describere de illis illum modum, qui est secundum locum tantum. Et intendit per primum locum, continens proprium, qui non est locus mediante alio. Et dixit, 'in eodem loco', quia, si continentia fuerint duo, erunt in duobus locis, non in eodem loco. Et, quia separata sunt opposita eis que sunt insimul, incoepit describere illa, et dixit: 'Et dico contigua', etc., i.e., contigua sunt corpora quorum ultima, scilicet superficies, sunt insimul, ita quod inter illas non est corpus extraneum". This interpretation is confirmed by Averroes' reply to a *dubium* introduced at the end of the discussion of chapter V.3 in the *Long Commentary*: "Et queret aliquis, quoniam esse insimul est tangere, quoniam omnia contigua sunt insimul, et omnia, que sunt insimul in loco, sunt contigua […]. Dicendum est igitur adhuc, ut videtur, quod licet esse insimul et tangere sint idem secundum subiectum, tamen sunt duo secundum definitionem, quoniam esse insimul opponitur ad esse solum, et tangere non opponitur ad esse solum, sed ad esse separatum. Et in definition eius non apparet locus, sed in definition eius quod est esse insimul apparet locus" (AVERROES, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 226rbE-F). Interestingly, Averroes, in this last passage, comes very close to the interpretation of the distinction betweeen 'being together in the same primary place' and 'touching' that I have presented above when discussing *Physics* V.3. That is to say, the two notions are explicitly taken by Averroes to be extensionally identical (i.e., *idem secundum subiectum*), yet intensionally different (i.e., *duo secundum definitionem*), although he interprets this intensional distinction, differently from what I have done above, in terms of the respective contrary of the two notions. While, Averroes remarks, the contrary of 'being together in the same primary place' is 'being alone', the contrary of 'touching' is 'being separate'. It is hard to understand, however, why Averroes does not consider 'being separate' as the contrary of 'being together in the same primary place' (as Aristotle does in *Physics* V.3), and 'being alone', at the limit, as being the contrary of 'touching'. Nevertheless, the exegetical strategy adopted by Averroes in the passage remains significant.

[205] We know, from Averroes' own references, that Averroes had at its disposal at least Alexander's *Physics* commentary on Books I, IV, V, VI and VII (cf. GLASNER, A*verroes' Physics. A Turning Point in Medieval Natural Philosophy*, *op. cit.*, especially pp. 52-56).

> And contiguous (*sese*) is that in which it is found a before and after [i.e., in a succession] in which the extremies are together (*insimul*) [in the same primary place], because this name, 'contiguity' (*sese*) means consecutivity (*consecutionem*) and touching (*tactum*) together. It means, therefore, two things, and therefore [Aristotle] said: 'And contiguous is that which is consecutive and touching', because touching bodies (*tangentia*) are of different species, contiguous ones (*sese*) instead are of the same species, such as consecutive ones[206].

The passage makes clear that Averroes shares the same basic interpretation as Alexander's and Simplicius' one. Moreover, for Averroes the way to find support for this interpretation in the Aristotelian text is (as I have hypothesised to be the case also for Alexander and Simplicius, where, however, there is no clear supporting textual evidence for this claim) to interpret Aristotle's idea that two entities are consecutive only if there is none of the same kind between them in the sense that two entities can only be consecutive if they are of the same kind. If this is so, then, *a fortiori* two contiguous entities need to be of the same kind (more precisely, of the same species, in Averroes' text, as in Alexander's one), insofar as being in succession is a necessary condition of contiguity, according to Aristotle.

Although Averroes interprets the distinction between touching and contiguity in a way that has clear precedents in the Late Ancient commentary tradition, his interpretation of the notion of touching shows, instead, a fundamental element of originality for which, as far as I know, there is no extant precedent, and that it is fundamental to underline here. Indeed, Averroes, in the *Long Commentary*, distinguishes between two kinds of touching, what he refers to as a *contiguatio naturalis* and a *contiguatio mathematica*[207]:

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[206] AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 224vK-L: "Et Sese est illud in quo invenitur prius et posterius, in quo ultima sunt insimul, quoniam hoc nomen sese significat consecutionem et tactum insimul. Significat igitur duo, et ideo dixit: 'Et Ses est illud quod est consequens et tangens', quoniam tangentia sunt de speciebus diversis, sese vero sunt eiusdem speciei, sicut consequentia'.

[207] The fact that Averroes is so frequently aware of the distinction between the two planes of the mathematical and the "physical" analyses, even when they are not distinguished in the corresponding Aristotelian text, is probably what ultimately led Glasner to claim (wrongly, I believe) that in Averroes there is a "divorce between mathematics and physics" (cf. GLASNER, *Averroes' Physics. A Turning Point in Medieval Natural Philosophy*, *op. cit.*, pp. 159-163). This expression, I believe, is not helpful at all. Instead, the careful distinction between mathematical and physical levels of analysis, which is probably Averroes' most important contribution to the development of the notion of continuity in the Medieval Aristotelian tradition, is (here and in other relevant passages) best interpreted (in accordance with what Aristotle claims in *Physics* II.2) as a conceptual distinction between two different ways to consider the continuity of natural bodies: either, as mathematical entities, without considering the problems arising from matter and movement, or, as "enmattered" entities, taking them into full account. That this is so is confirmed by a number of further passages both from the *Epitome* and the *Long Commentary* on the *Physics*. In the *Epitome*, cf., for instance, AVERROES, *Epitome de Fisica (Filosofía de la naturaleza)*, PUIG MONTADA

> Those bodies are contiguous, whose limits, i.e., surfaces are together, so that between those there is no extraneous body. And this is 'natural touching' (*contiguatio naturalis*). 'Mathematical touching' (*contiguatio mathematica*) instead is in magnitudes whose limits overlap. If, therefore, they are bodies, their touching surfaces overlap; and, if they are surfaces, their lines overlap, and, if lines, points overlap: in the way in which it is said that a point is located on a point. But here he [i.e., Aristotle] does not intend [to consider] mathematics, because in mathematical entities the two limits become one, and so they are assimilated in a continuous [entity]: in natural entities [insofar as they are natural, i.e., enmattered and subject to movement and change] instead the two limits remain two distinct [entities]. And therefore he [i.e., Aristotle] said that while the two extremities are together, they are also touching entities, those whose limits, which are in act, are together, and are called touching, such as he said, while the limits are together. And this means that touching has this sense. And by 'together', he means here those, which are [together] in place. And according to this it [i.e., the limit] will be in a place *per accidens*, because the limits are not in a place essentially[208].

(trans.), *op. cit*., p. 185: "Lo continuo, en cuanto es continuo, es algo cuyo estudio es común al filósofo de la Naturaleza y al matemático, pero bajo dos aspectos diferentes, de acuerdo con el carácter proprio con que ambos estudian un mismo objeto. Se trata de que el matemático lo estudia en cuanto está separado de la materia, mientras el físico lo hace en cuanto le acontece al estar en una materia"). In the *Long Commentary*, cf. for instance AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 114rD-E: "Sed, si quis consyderaverit verba Aristotelis, videbit ipsum dicere verum: consyderatio enim Naturalis de mensura est, secundum quod est finis, et existens in materia, consyderatio vero Geometrae, secundum quod est abstracta a materia, et, cum mensura consyderatur his duobus modis, invenitur secundum dispositiones oppositas, et convenientes. Convenientia enim est in hoc, quoniam semper diminuitur, sive consyderetur secundum quod est in materia, sive secundum quod est in imaginatione. Propositio igitur Geometrae <conveniens> est quam possibile est imaginari ad omnem lineam lineam minorem illa, et propositio Naturalis conveniens isti (*pro*: ista) est, quod linea potest diminui in infinitum: et propositio Geometrica, dicens quod possibile est imaginari ad omnem lineam lineam maiorem illa est vera, Naturalis vero, dicens quod omnis linea potest crescere in infinitum, est falsa. Quia contingit ex ea magnitudinem esse infinitam in actu." It is an unavoidable consequence of her interpretation of the relation between mathematics (specifically geometry) and natural philosophy in Averroes that Glanser is further led to claim that "*Continua*, for Averroes, belong to the domain of geometry, not of physics" (GLASNER, *Averroes' Physics. A Turning Point in Medieval Natural Philosophy*, *op. cit.*, p. 161). I will show below how, in any case in the context of the Latin translation of the *Long Commentary* on the *Physics*, although Averroes clearly distinguishes between continuity as applying to geometrical entities and continuity as applying to "physical" magnitudes, he certainly does not claim that continuity only belongs to the former and not to the latter. Nevertheless, the insistence on the fact that a material substance, as a hylomorphic compound, is (potentially) infinitely divisible insofar as it is considered as a continuous magnitude, and not as hylomorphically structured, is a distinctive aspect of Averroes' doctrine of *minima naturalia* (partially inspired by Philoponus), as I will show in the following chapter, one which, moreover, will have an important posterity in the Latin Middle Ages.

[208] AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 223rC-E: "Contigua sunt corpora, quorum ultima, scilicet superficies sunt insimul, ita, quod inter illas non est corpus extraneum. Et haec est contiguatio naturalis. Contiguatio vero mathematica est in magnitudinibus, quorum ultima superponuntur. Si igitur fuerint corpora, superponuntur superficies eorum contiguae: et, si superficies, superponentur lineae, et si lineae, superponentur puncta: sicut dicitur quod punctus superponitur puncto. Sed hic non intendit Mathematicam, quoniam in mathematicis duo ultima revertuntur in unum, et sic assimilantur continuo: in naturalibus vero duo ultima remanent duo demonstrata. Et ideo dixit dum extremitates sunt insimul, i.et res contiguae sunt, quarum ultima, quae sunt in actu, sunt insimul, et dicuntur contigua, sicut dixit, dum ultima sunt insimul.

Averroes rightly points out that in mathematical (geometrical) entities (i.e., on the plane of mathematical, and specifically geometrical, analysis) there is no way to distinguish between touching and continuity. Indeed, assuming as a premiss that geometrical entities are of the same species (and that therefore, in their case, the distinction between touching and contiguity does not apply), when the limits of two geometrical figures, or lines, or points touch (so that the two figures are contiguous), they immediately become one (i.e., they give rise to a single continuous entity)[209], while this is not so in natural bodies (i.e., in bodies considered as "enmattered" entities), where, due to the presence of matter, it is possible for the limits of two entities to touch without becoming one (they will simply have their extremities "coinciding" in one primary place)[210]. For them to become contiguous (and *a fortiori* continuous), as seen above, a further condition would have to be met, namely, that the two entities considered are of the same species.

The fact that Averroes is committed to thoroughly distinguish the mathematical (geometrical) and the "physical" levels of analysis in his discussion appears as well from

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Et hoc significat quod contiguatio significat hanc intentionem. Et per simul, intendit hic illa, quae sunt in loco. Et secundum hoc erit in loco per accidens: quoniam ultima non sunt in loco essentialiter."

[209] Here Averroes is probably applying Aristotle's remarks in *Physics* VI.1, 231a29-b6 concerning the fact that, when two points "touch", they can only touch "whole to whole", so as to become one (and therefore they are not touching at all), a passage to which Averroes refers explicitly a few sections later in his commentary on *Physics* V.3 (cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 225vM). Aristotle used this remark, as seen, to argue against the possibility that two indivisibles can be 'in contact' (contiguous) and, *a fortiori*, that they cannot be continuous with each other. By applying Aristotle's remark in the context of *Physics* V.3, Averroes shows that, if this claim is rigorously applied, not only one is forced to say that when two lines touch their limits, which are points, inevitably become one, therefore making the two lines a continuous entity, but the same applies for any limit of a geometrical entity, such as lines for two-dimensional figures and surfaces for three-dimensional ones.

[210] The same distinction is summarised by Averroes at the end of his discussion of *Physics* V.3 in the *Long Commentary*: "Sese autem separatur a contiguo, quoniam sese est contiguum et sequens, et ses etiam potest esse corpus, et potest esse non corpus, verbi gratia motus aut tempus. Motus enim est sese ad motum, et tempus ad tempus, sed tempus non tangit tempus, quoniam contigua necessario sunt magnitudines. In naturalibus vero est corpus, in mathematicis autem potest esse linea, aut superficies. Sed omne contiguum in mathematicis est continuum" (AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 226rF). Here Averroes also inserts an extremely important new element that, however, lies mostly outside the scope of the present chapter, which is focused on the continuity of magnitudes. Indeed, Averroes remarks, in this final passage, that the parts of motion and time can only be contiguous with each other, and never merely touching. This, of course, assuming Averroes' criterion of distinction between touching and contiguity, follows from the fact that all the parts of motion, as all those of time, are of the same species. Nevertheless, even without assuming such a criterion motion and time are necessarily contiguous insofar as they are considered continuous, and insofar as continuity is conceived as entailing contiguity.

his analysis of continuity proper. Indeed, Averroes introduces his exposition of the notion of continuity in the following way:

> Continuous, moreover, are those [entities] which are contiguous (*sese*), whose limits are joined by contact, and become one. And in this a continuous [entity] differs from a contiguous [one]. After he says in what sense this name [i.e., that of continuity] is used of natural entities and of artificial ones. In natural ones indeed we say that those are continuous, whose limits are one naturally, such as in the continuous parts of a body: and in artificial ones, because their limits become one according to an artificial intervention. *In mathematical entities moreover we speak of continuous ones, because one limit is imagined as being common with those, such as a point, which is common to two lines, and a line, [which is common] to two surfaces. And this continuity is not natural: and here we intend to describe natural continuity*[211].

Averroes here uses the distinction previously established between *contiguatio naturalis* and *contiguatio mathematica* to note in what way continuity can apply to mathematical (geometrical), as opposed to natural, entities. Thus, it is well possible, in analogy with the terminology adopted by Averroes above, to speak of a *continuatio naturalis* as distinguished from a *continuatio mathematica*. Again, the difference is better interpreted as a methodological, rather than an ontological, one, and it bears witness to Averroes' worry to avoid any possible ambiguity, in the exposition of the Aristotelian text, between the mathematical and the "physical" planes of analyses. This is probably the aspect of Averroes' doctrine of continuity that would have had the strongest influence on the Medieval Latin understanding of continuity itself.

Interestingly, moreover, Averroes also remarks in this passage that there is a third plane of analysis that should be carefully distinguished from both that of 'natural' and that of 'mathematical' continuity, namely, that of artificial entities (something already present in Aristotle). In their case, indeed, merely joining the limits of various entities (such as the pieces of wood forming a table) by an artificial intervention does not produce the same kind of continuity to be found in "natural" entities. Of course, the reference to

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[211] AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, ff. 224vI-225rA: "Continua autem sunt sese, quorum ultima adunantur apud contactum, et fiunt unum. Et in hoc differt continuum a sese. Deinde dicit secundum quod significat hoc nomen, in rebus naturalibus et artificialibus. In naturalibus vero dicimus quod continua sunt illa, quorum ultima sunt unum naturaliter, ut in membris continuis: et in artificialibus, quoniam ultima eorum fiunt unum per artificium. *In mathematicis vero dicimus continua, quoniam ultimum unum imaginatur esse commune cum eis, ut punctus, qui est communis duabus lineis, et linea duabus superficiebus. Et ista continuatio non est naturalis: et hic intendimus describere continuationem naturalem*" (my emphasis).

artifacts, and the question of whether they can ever be said to constitute one continuous entity, is a question that would have a fundamental posterity in the Medieval Latin world. Such aspect, however, will not be investigated in the present thesis, which, as said from the outset, merely focuses on "natural" entities, that is, of material substances endowed with their own internal principle of motion and of change more generally[212].

Another innovation concerning Averroes' analysis of continuity in the *Long Commentary*, one which goes in the same direction, is represented by the fact that, probably due to Aristotle's remark at 227a13-14 according to which "continuity belongs to things that naturally in virtue of their mutual contact form a unity", Averroes deems worthy to distinguish between what he calls *continuatio*, i.e., the process according to which the extremes of two contiguous (*sese*) entities come to form a unity, and *adunatio*, i.e. the process according to which the common extreme is destroyed so that what remains can be truly called a unity[213]. The distinction is made clear in the following passage:

> And, because unification (*adunatio*) is the process according to which the common limit, which is between two continuous [entities], is destroyed, and this happens necessarily after the [process of] becoming continuous (*continuatio*) […][214].

Although the exact nature of the distinction between *continuatio* and *adunatio* is not explained in detail by Averroes, what is certainly clear is that the need to distinguish between the process through which the limits of two entities become one and the process through which, after this first stage, such entities become one, represents an important addition to Averroes' overall doctrine of continuity. More specifically, such a distinction testifies to the fact that, in Averroes' doctrine of continuity, the relation between the notion of continuity and that of unity, especially relevant in Aristotle's *Metaphysics*, still plays a

[212] For a general overview of the Medieval Latin debate on the metaphysics of artifacts, see K. MAJCHEREK, *Medieval Metaphysics of Artifacts, 1250-1500*, Ph.D. thesis, Toronto, University of Toronto, 2022.

[213] Cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 225rC: "Et quasi intendit dicere (sc. Aristoteles) quemadmodum sese transfertur de secatione ad continuationem, similiter transfertur de continuatione ad adunationem."

[214] AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 225vI: "Et, quia adunatio est quandum ultimum commune, quod est inter duo continua, destruitur, et hoc accidit necessario post continuationem [...]." Cf. as well *ibid*., f. 225rC, the passage quoted in the previous footnote. And, again, cf. also *ibid*., f. 225vI: "Et, quia adunatio est quando ultimum commune, quod est inter duo continua, destruitur, et hoc accidit necessario post continuationem […]."

rather prominent role. As I will show below, this will not be the case (or at least not to the same extent) in the Latin Middle Ages.

Averroes' discussion of *Physics* VI.1, both in the *Epitome* and in the *Long Commentary*, is also interesting in an attempt to reconstruct the defining features of Averroes' theory of continuity. The exposition in the *Long Commentary* is especially wary of underlining all the subsequent stages of Aristotle's argumentation, which, as seen above, is far from immediately perspicuous. In doing so, Averroes makes a massive recourse to the instrument of syllogisms, both categorical and hypothetical, a feature absent from the Aristotelian text and, while influenced by the Late Ancient commentators (and even more so by Avicenna), still not applied by them to the text of *Physics* VI.1, as seen above. Although it is not possible to consider this issue further here, it is important to remark that, as Glasner has shown, in the footsteps of Henri Hugonnard-Roche, "[…] the increasing formalization reflects an inner development of Averroes' philosophy[215]". In other words, it is especially in the later stages of his life, to which a substantial revision of the *Long Commentary* on the *Physics* belongs, that this feature of Averroes' exposition of Aristotle's philosophy is to be associated.

In the case at hand, Averroes identifies, specifically, a first section of the first part of *Physics* VI.1 (231a18-28), where, by a syllogism which he classifies as a (categorical)

[215] GLASNER, *Averroes' Physics. A Turning Point in Medieval Natural Philosophy*, *op. cit.*, p. 44. On the whole issue, cf. *ibid*., pp. 43-52. The observation that, generally speaking, the use of formalised logical procedure increases when moving from the short and (partially) middle commentaries towards the long ones has been first formulated, to my knowledge, in H. HUGONNARD-ROCHE, "Remarques sur l'évolution doctrinale d'Averroès dans les commentaires au *De caelo*: le problème du mouvement de la terre", *Mélanges de la Casa de Vélazquez* 13, 1977, pp. 103-117, especially pp. 115-116. Although Hugonnard-Roche refers specifically to Averroes' commentaries on the *De caelo*, it seems worth quoting the passage in full, insofar as it perfectly captures the evolution between Averroes' *Epitome* and the *Long Commentary* on the *Physics* in the use of syllogisms to formulate Aristotle's arguments, specifically with reference to *Physics* VI.1: "D'une manière générale, Averroès cherche à souligner la construction logique des raisonnements d'Aristote ou même à leur donner explicitement la forme logique (implicite, selon lui, chez Aristote) qui lui paraît les rendre valides, en les reformulant, au besoin, selon des schémas syllogistiques. Dans ce but, il découpe le texte aristotélicien en propositions, met en évidence les propositions qu'il juge fondamentales, dévoile les propositions qu'il estime présupposées, explicite les consécutions ou les contradictions entre propositions, etc. Cette mise en forme, pratiquement absente de l'*Epitome*, est déjà parfaitement élaborée dans le *Commentaire moyen*, [...]. Cette méthode d'exposition reste la même, en son principe, dans le *Grand commentaire*, mais elle y reçoit un développement supplémentaire en ce qu'elle est appliquée systématiquement à chacun des plus petits élements de l'argumentation d'Aristote, voire à chacune des phrases du texte expliqué, au risque d'aboutir parfois à des résultats contraires à la doctrine aristotélicienne."

syllogism of the second figure[216], Aristotle shows that, since indivisibles do not have parts, they cannot be either continuous or contiguous, so that they cannot also compose continuous entities. After this first section, Averroes identifies a second one (231a29-b9) in which Aristotle shows that continuous entities cannot be divided in indivisible parts (using, this time, a hypothetical syllogism of the second figure[217]). A third section of the

[216] A syllogism, therefore, in which the predicate is the same in both premisses (according to Aristotle's definition in the *Prior Analytics*, read, however, as will be pointed out below, through the lens of the commentary tradition and especially of Avicenna's *al-Qiyās*):

A. All entities that are continuous or contiguous are divided into their limits and into those parts which have limits.
B. Yet, points (or any other indivisibles) cannot be divided in these two elements.
C. Therefore, points (or any other indivisbles) are nither continuous nor contiguous.

(cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 247rA: "Et iste sermo componitur sic in secunda figura. Omnia, ex quibus componitur continuum, dividuntur in ultima, et in habentes ultimum: ultimum nam est ultimum alicuius rei: et punctus non dividitur in haec duo: ergo continuum non componitur ex punctis, et aequaliter ex indivisibilibus"). Averroes' tendency to give syllogistic form to Aristotle's arguments plays a special role in the *Long Commentary* on *Physics* VI.1. In the *Epitome* Averroes also presents this syllogism (cf. AVERROES, *Epitome de Fisica (Filosofía de la naturaleza)*, PUIG MONTADA (trans.), *op. cit.*, p. 186: "Las cosas de las que se compone el continuo son las que tienen unos extremos y límites, y que si se unen, se dice que la magnitud resultante es continua. Las cosas que son indivisibles, no tienen extremos ni límites, por los que diga – si se unen esas – que la magnitud resultante es continua: por tanto, lo continuo en cuanto continuo, no se compone de cosas indivisibles"), together with a hypothetical syllogism proving the same conclusion, and with two arguments which are a version of fr. 100 Wehrli, i.e., of Eudemus' arguments concerning the division in halves of a line, respectivley, and of the diameter of the circumference (*ibid*., p. 187: "Además, cuando suponemos esto [i.e., that a continuous entity is composed of indivisibles], resultan numerosas falsedades de los principios utilizados por el geómetra. Estos son que toda línea puede dividirse en dos mitades y que el diámetro divide la circunferencia en dos mitades, pues ellos no valdrían ni para la línea ni para la circunferencia que se compusiera de un número impar de puntos"). Since the arguments are quoted without referring them to Eudemus, and since the second of them refers to the halving of the circumference (rather than the circle) by the diameter, it seems to be indebted to Themistius' rather than to Simplicius' commentary (cf. THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, *op. cit.*, 182.24-183.1, quoted in the previous section). Yet, as mentioned in the previous section, the argument is used, in the Arabic tradition, also by al-Ghazālī in his *Metaphysics* (together with other five anti-atomistic arguments, some of which were to exercise a fundamental influence on the subsequent Latin debate on continuity, as it will be shown below) although in a "dynamical" reformulation which appears to be significantly different both from Themistius' and from Simplicius' presentation (cf. ALGAZALIS, *Metaphysica*, Book I, tr. 1, cap. 2, critically edited in its Latin translation as ALGAZALIS, *Algazel's* Metaphysics*: A Medieval Translation (St. Michael's Medieval Series)*, ed. J.T. MUCKLE, Toronto, St. Michael's College, 1933, p. 11: "Secundus est ut disponantur quinque substancie predicte in modum linee, et super duas extremitates linee ponantur due hoc modo. Intellectus autem sine dubio potest recipere hanc posicionem, scilicet, poni illas duas partes suprapositas simul incipere moveri equaliter contra se quousque iungantur. Et hoc posito, unaqueque illarum secabit partem de media; media igitur iam dividitur, alioquin sequitur illas non posse sibi occurrere motu equali. Sed cum inceperit moveri, et una earum pervenerit ad secundam partem linee, quiescat ibi donec alia perveniat ad terciam partem linee. Sed unde hec varietas huius motus inequalis, vel unde accidit hoc pocius dextre quam sinistre cum utraque eque potuit hoc facere, et utraque eque sit motus receptibilis", quoted in GRELLARD, *Les présupposés méthodologiques de l'atomisme: la théorie du continu chez Nicolas d'Autrécourt et Nicolas Bonet*, *op. cit.*, p. 183).

[217] A syllogism, that is, which presents a hypothetical premiss, and which, in this case, proceeds as follows:

A. if a continuous entity is composed of indivisibles, these indivisibles must be continuous.
B. Nevertheless, this is not the case.
C. Therefore, no continuous entity is composed of indivisibles.

first part of the chapter, then, according to Averroes, is the one running from 231b10 to 231b17. An interesting notice, in opening his commentary on this section, is that, according to Averroes, Aristotle is here almost "obsessed" with his insistence on proving that continuous entities cannot be composed of indivisibles, since, as he rightly remarks, claiming that they cannot divide into indivisibles is exactly the same as claiming that they are not composed of indivisibles, according to a standard Aristotelian principle[218]. Averroes' exposition is close to the Aristotelian text. He only remarks, rightly, that

Averroes' immediate precedent for the formulation of this kind of syllogism (and, in general, for any hypothetical syllogism, which is something foreign to Aristotle and first introduced only by Theophrastus and developed, most notably, by the Stoics) is the section on logic contained in Avicenna's *Shifā'*, and especially the *al-Qiyās* (cf. the English translation AVICENNA, *The Propositional Logic of Avicenna: A Translation from* al-Shifā': al-Qiyās *with Introduction, Commentary and Glossary (Synthese Historical Library)*, N. SHEHABY (ed. and trans.), Dordrecht, Springer, 1973). Now, according to Avicenna's classification, the syllogism mentioned above would be an exceptive (i.e., conditional, as opposed to disjunctive, or, in Arabic, *istitha'i* as opposed to *iqtirani*) hypothetical syllogisms of the second figure (since, in Avicenna's hypothetical logic, at least in the case of exceptive hypotheticals, there is an almost exact correspondence with the figures of Aristotle's categorical logic in the *Prior Analytics*). Averroes' construction, however, is much more refined than this presentation would imply, since, in showing how Aristotle argues for premiss B, he inserts three other syllogisms of the second figure. The first case (that points are continuous) is ruled out by the syllogism presented above. That they cannot be contiguous is proved by Aristotle, according to Averroes, through another hypothetical syllogism of the second figure: if indivisibles are contiguous, they must touch with each other either whole to whole, or part to part, or whole to part. Yet, none of these three ways of touching is possible between indivisibles. Therefore, no indivisibles are contiguous. That the second premiss is true is proved by Averroes through three other syllogisms. After this complex demonstration, a final syllogism (categorical, this time) of the second figure, proves that indivisibles cannot be in succession: indeed, two things are said to be in succession when there is nothing of the same kind between them. Yet, between any two points (or two instants, or any other indivisible) there is always something of the same kind (namely, other points, or instants, or other indivisibles of the same kind). Therefore, no indivisibles are in succession (this complex construction is developed throughout almost all the *textus* 2 of Averroes' commentary on *Physics* VI.1, cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 247vG-248rA: "Iste est secundus syllogismus, et componitur sic. Si continuum componitur ex indivisibilibus, verbigratia punctis, necesse est, cum continuum componitur ex illis, ut sint aut continua, aut contigua, aut consequentia. Deinde excepit ea esse continua ex illo, quod declaravit in demonstratione predicta. [...] Deinde declaravit quod impossibile est etiam quod puncta sint contigua [...].Et, cum destruxit continuum componi ex indivisibilibus secundum continuationem, aut contiguationem, et aliquis protervius posset dicere illud componi ex illis secundum consecutionem, incoepit destruere istum modum compositionis [...]. Et hoc declaratum est ex partibus istius syllogismi, et ex hoc quod puncta impossibile est ut separentur a linea. Et hoc manifestum est ex hoc, quod puncta sunt ultima lineae"), which is followed by a section, f. 248rA-B, where Averroes, among other considerations, refutes the possibility that there be a void between two consecutive entities). Part of the considerations present in this part of Averroes' *Long Commentary* also find their parallel in the *Epitome* (cf. AVERROES, *Epitome de Fisica (Filosofía de la naturaleza)*, PUIG MONTADA (trans.), *op. cit.*, pp. 185-186).

[218] Cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 248rE: "Haec est quasi alia declaratio super hoc, quod continuum non componitur ex indivisibilibus. Et istae declarationes sunt quasi abundantes. Et ipse (sc. Aristoteles) procedit ex hoc ad declarandum quod continuum dividitur semper in divisibilia." On Averroes' remarks concerning Aristotle's repetitions in the first part of *Physics* VI.1, cf. also *ibid.*, f. 248vI: "Deinde declaravit quomodo sequitur hoc, ex hoc sermone, et iteravit ipsum, ut sit magis manifestum", and *ibid.*, f. 250vK: "[...] licet iam declaravit [i.e., Aristoteles] ipsum [...]."

Aristotle's demonstration is founded here upon the principle of the excluded middle, since there cannot be any third alternative between divisible and indivisible, so that if a continuous entity is not divisible into indivisible components it must be divided into components which are still divisible[219].

Concerning the second part of the chapter, Averroes is keen on enunciating the 'isomorphism thesis' concerning the application of quantitative properties to magnitudes, time, and motion[220]. Therefore, since, in case magnitudes were indivisible, also motion over a magnitude would be, and that is certainly false, so is the main premiss from which this conclusion stems, i.e., that magnitude is indivisible. It is to be noted that, even in Averroes' interpretation, it is always the case that it is the continuity of magnitudes to ground that of motion (which, in its own turn, grounds that of the time through which motion occurs)[221].

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[219] Cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 248vH: "et dixit: 'et impossible est, ut inter haec duo sit medium genus, etc.', i.<e.> intendit inter divisibile et indivisibile."

[220] Cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f.248vL-M.

[221] Cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 250rB: "[...] cum causa continuationis motus et (*pro*: est) continuatio magnitudinis." Although, of course, the isomorphism thesis also implies that the continuity of time must necessarily presuppose those of motion and of magnitude: "Et forte, cum declaravit, (sc. Aristoteles) quod, cum magnitudo fuerit divisibilis, tempus erit divisibile, declaravit etiam conversam, quod intendebat, scilicet quod, cum tempus fuerit divisibilis, magnitudo erit divisibilis, et hoc manifestum est ex hoc, quoniam cum motum, quod est aequalis velocitatis, movetur per aliquam magnitudinem, cum dividit tempus, dividit magnitudinem, et, cum declaravit quod, si tempus fuerit divisibile, magnitudo erit divisibilis, fuit declaratum quod, si magnitudo fuerit indivisibilis, tempus erit indivisibile. Quoniam destructio consequenti sequitur oppositum praecedentis, et in hoc capitulo intendebat declarare habitudinem, quae est inter spatium, et tempus, sicut est dispositio inter spatium, et motum" (*ibid*., f. 252rB-C). The isomorphism thesis is also mentioned in the *Epitome* (cf. AVERROES, *Epitome de Fisica (Filosofía de la naturaleza)*, PUIG MONTADA (trans.), *op. cit*., pp. 188-190, esp. p. 188: "Así también podemos demostrar que la magnitud no se compone de lo indivisible, por cuanto el movimiento tiene dicha característica, pero antes demostremos que, si la magnitud se compone de lo indivisible, entonces el movimiento que tiene lugar a lo largo de ella, también está compuesto de movimientos indivisibles y también el móvil es indivisible e igualmente el tiempo en el que se produce el movimiento"). It also finds its place in the *Long Commentary* on *Metaphysics* Δ.13, where Averroes takes a somewhat stronger view on the dependence of the continuity of motion and time on that of magnitude: "[...] et ista (sc. motus et tempus) sunt quantitates quia sunt accidentia consequentia essentialiter illa, quae sunt quantitates per suam substantiam, scilicet magnitudinem, quae dividitur essentialiter, et primo motus enim consequitur magnitudinem, et dividitur per suam divisionem, et tempus consequitur motum. Ista igitur sunt de passionibus quanti, non de substantia quanti" (AVERROES CORDUBENSIS, *Aristotelis Metaphiysicorum libri XIIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metpahysicorum liber*, *op. cit.*, f. 125vH).

More than what is present in Averroes' exposition[222], it is remarkable what is absent from it: indeed, contrary to Late Ancient commentators, who took the opportunity of commenting on *Physics* VI.1 to argue against Epicurean atomism (and also contrary to Avicenna, who took all the opportunities offered by the discussion of the continuity of magnitudes, motion and time to argue against *kalām* atomism[223]) Averroes does not insert any polemical remark against contemporary or past versions of atomism, in addition to those of Leucippus and Democritus against which Aristotle himself argued in the chapter[224].

Turning now to Averroes' *Middle Commentary* on the *De generatione*[225], the first important element to underline is the way in which Averroes presents and discusses the

[222] This is not to say that Averroes' discussion is devoid of further innovations, when compared with Aristotle's text and the previous commentary tradition. For instance, when commenting on Aristotle's remark at 231b26-28 that if motion were indivisible one would be in motion and have completed the motion at the same time, so that it would have moved without moving, Averroes notes (cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 250vG) that this would imply that motion would be without a purpose (*ociosa*), since it would never fulfill its proper function (an aspect to which Averroes is very sensitive also in his *Long Commentary* on the *Metaphysics*, as I will mention in Chapter 2 and, especially, 4 of the present thesis).

[223] See on this especially the useful remarks contained in MCGINNIS, "A Continuation of Atomism: Shahrastānī on the Atom and Continuity", *op. cit.* For what concerns Avicenna's natural philosophy most generally, see especially A. LAMMER, *The Elements of Avicenna's Physics. Greek Sources and Arabic Innovations (Scientia Graeco-Arabica 20)*, Berlin, de Gruyter, 2018. Unfortunately, as said, there is no space in the present chapter to discuss Avicenna's views, or those of other thinkers from the Islamic world.

[224] One last consideration must be devoted to a topic discussed in the previous sections of this chapter, namely, the allegedly new "definition" of continuity as infinite divisibility that Aristotle provides in *Physics* VI.2, 232b24-26. Here, Averroes, akin to Late Ancient commentators, and, I believe, rightly interpreting Aristotle, does not talk of a 'definition', rather only of an implication (which, presumably, however, according to Aristotle should better be understood as a co-implication). In the *Epitome*, Averroes remarks the following: "Mediante este tratado se ha demonstrado que lo continuo, en cuanto continuo, es infinitamente divisible y que no se compone de lo indivisible" (AVERROES, *Epitome de Fisica (Filosofía de la naturaleza)*, PUIG MONTADA (trans.), *op. cit*., p. 193). In the *Long Commentary*, instead, Averroes remarks that "continuum nam cum fuerit tale (sc. divisibile in infinitum), necesse est ut tempus sit continuum, idest quoniam, cum continuum ponatur huiusmodi, et tempus etiam fuerit huiusmodi, sequitur ut tempus sit continuum" (AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, ff. 255vM-256rA).

[225] I will only refer, in my exposition, to the critical edition based on the Latin translation, without taking into account also the one based on the Hebrew translation (cf. *supra* in this section for the full bibliographic references to both versions). I do not take into account the *Epitome* on the *De generatione* here, since it does not contain any element of interest concerning the Aristotelian passages discussed. Indeed, in his *Epitome* on *De generatione* I.2, Averroes does not even present the "atomistic dilemma", rather, he simply says, concerning the atomists, that "[o]tros hacían la distinción entre la alteración y la generación considerando la generación como agregación y dispersión por ejemplo, los atomistas. Ahora bien, éstos afirmaban que la alteración es algo que aparece a los sentidos y que no es algo real, porque los elementos no reciben la afección, ya que si la recibieran, serían compuestos" (AVERROES, *Epitome del libro Sobre la generación y la corrupción*, PUIG MONTADA (ed. and trans.), *op. cit*., pp. 37-38). For what concerns *De generatione* I.8, Averroes does not mention Aristotle's specific arguments against the atomists (thus not even the one of interest to this chapter), rather he simply notes that the refutation of atomism has been established in *Physics* VI: "En cuanto a la opinión que considera que la causa de la pasión es la

"atomistic dilemma" which Aristotle introduces in I.2, and which has been presented above. Now, the dilemma is based on the fact that, by assuming the infinite divisibility of what is continuous, one of the two might ensue: either, once a body is fully divided, nothing remains (or a point), or something which is indivisible. Averroes' presentation of the dilemma, and of Aristotle's solution (i.e., that the infinite divisibility of magnitudes is only potential, yet not actual), together with the further objection to this solution and Aristotle's reply, is marked by a terminological ambiguity (one reminiscent of Philoponus' commentary on the chapter), which, however, is ultimately done away with by Averroes himself. Indeed, Averroes starts his exposition of the dilemma by assuming that Aristotle, throughout the argument, is only talking of a *simultaneous* division of the totality of a given magnitude, and not of *successive* stages of division[226]. Yet, Averroes' exposition of Aristotle's final solution not only, I believe, is fundamentally right as far as the Aristotelian text is concerned, but it also explains in clear terms that Aristotle is denying that a continuous entity can be infinitely divided in act not only simultaneously, but also successively:

> And therefore we see that, once we have divided a magnitude at some point, it is impossible that the division falls on a point in succession to that point, [something] which was possible before the division had fallen onto that [first] point, such as it was possible in that [second] point. But once the division fell onto the first point, immediately it was prevented the possibility of division at the second. Therefore, once we have taken a certain point, it is possible that the magnitude is divided over the same in whatever place we want. But once the magnitude will have been divided over itself at some place, then it will be impossible that it will be divided over a second point in any place we want, since it is impossible that it be divided over a point in succession to the first[227].

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interpenetración de dos átomos que son agentes y pacientes de manera recíproca, ésta es una opinión basada en la doctrina de la existencia de los átomos, y en el libro VI de la *Física* ya se ha demostrado su falsedad" (*ibid*., p. 47).

[226] Cf. Averroes' initial presentation of the dilemma: "Et cum posuerimus quod corpus dividitur secundum totum *insimul*, tunc necesse est ut dividatur in magnitudines indivisibiles aut in magnitudines divisibiles aut in puncta aut in aliquod accidens aut in nichilum" (AVERROES CORDUBENSIS, *Commentarium medium in Aristotelis de Generatione et Corruptione libros*, ed. FOBES, KURLAND, *op. cit*., 8.16-20, p. 16; italics mine). The qualification of the process of division implied by the argument as being *insimul* is maintained throughout all the ensuing discussion. This is especially clear by the following comparison made by Averroes: "Non enim contingit, cum omne punctum in corpore est receptibile divisionis insimul, ut corpus dividatur super ea insimul, quamvis indifferenter sit divisibile super unumquodque eorum, sicut non contingit quod, cum homo est receptibilis omnium scientiarum, ut recipiat eas insimul. Quod enim dicitur de aliquo divisim, non sequitur ut semper dicatur coniunctim" (*ibid*., 9, 19.55-61).

[227] AVERROES CORDUBENSIS, *Commentarium medium in Aristotelis de Generatione et Corruptione libros*, ed. FOBES, KURLAND, *op. cit*., 9, 19.64-20.8: "Et ideo videmus quod, cum divisimus magnitudinem super aliquod punctum, quod (*sic*!) est impossibile ut divisio cadat super punctum consequens illud punctum, quod erat possibile antequam divisio caderet super illud punctum, sicut erat possibile in illo puncto. Sed

The passage makes abundantly clear that, according to Averroes, it is not simply impossible, in Aristotelian terms, to simultaneously divide a magnitude at all of its points, but that, once a magnitude is divided at a given point, it becomes impossible to divide it, even in successive stages of division, at the points immediately "next" to it, since the point actualised by the first division can exist only insofar as it is the limit of a line which "occupies" the position immediately "next" to it. While Averroes is not fully explicit in his presentation, it is clear enough that this is the direction towards which his interpretation points[228].

Moving now to Averroes' *Middle Commentary* on *De generatione* I.8, it is possible to find one of the passages which, most clearly, shows Averroes' stance concerning the problem of the (potential) infinite divisibility of magnitudes. It is a passage which, it goes without saying, is a close reading (even a paraphrase) of the Aristotelian corresponding text quoted above (i.e., 326a24-29, where Aristotle notes that it is absurd to attribute indivisibility to small bodies, yet not to greater ones):

> And it is also superfluous to claim that they [i.e., the allegedly indivisible parts of a magnitude] are small, since it is of their nature to be indivisible. It behoves us, instead, because we believe that body is divisible, [to affirm] that smallness is according to us the cause of the difficulty of division, but accidentally ('*accidentaliter*'), and the magnitude the cause of the easiness [of division], since [a great magnitude] touches more of the [dividing] agent than it does a small one. And, in general, [the atomists] cannot say why small [magnitudes] are more worthy of not being divided than great [ones][229].

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cum divisio cecidit super primum punctum, statim fuit destructa possibilitas divisionis in secundo. Cum igitur acceperimus aliquod punctum, possibile erit ut magnitudo dividatur super ipsum quocumque loco voluerimus. Sed cum magnitudo fuerit divisa super ipsum in aliquo loco, tunc impossibile erit ut dividatur super secundum punctum in quo loco voluerimus, cum impossibile est ut dividatur super punctum consequens primum."

[228] It is worth remarking, in closing this part of the exposition, that Averroes considers important to restate in rather strong terms his opposition to any form of indivisibilism. After the passage just quoted, he tellingly notes, for instance, the following: "Et iam declaratum est ex hoc sermone destructio sue demonstrationis super magnitudines esse indivisibiles, et etiam iam declarata est destructio istius opinionis per se; manifestum est igitur quod, si segregatio et congregatio est, necesse est ut segregatio non sit in indivisibilia neque congregatio ex indivisibilibus, et quod ymaginari hoc propter divisionem corporis secundum totum non esset verum nisi punctum sequeretur punctum" (AVERROES CORDUBENSIS, *Commentarium medium in Aristotelis de Generatione et Corruptione libros*, ed. FOBES, KURLAND, *op. cit.*, 9, 20.8-16).

[229] AVERROES CORDUBENSIS, *Commentarium medium in Aristotelis de Generatione et Corruptione libros*, ed. FOBES, KURLAND, *op. cit*., 70, 80.9-15: "Et etiam superfluum est dicere eas esse parvas, cum de natura earum sint indivisibiles. Nos autem, quia opinamur corpus esse divisibile, continget ut parvitas sit apud nos causa difficultatis divisionis, sed accidentaliter, et magnitudo causa facilitatis, cum tangat de agente plus

The utmost attention must be brought here to the adverb *accidentaliter*: a continuous magnitude remains always essentially (potentially) infinitely divisible, insofar as it is continuous, and this holds both for geometrical entities and natural bodies. Yet, in the latter case, Averroes (following, albeit in a more moderate way, a traditional remark, at least since Philoponus[230]) admits that there might be accidental constraints to the (physical) division of sensible magnitudes, depending on their size. I believe, therefore, that this passage is best read without establishing a connection with any notion of hylomorphic *minima*. For Averroes, as for Philoponus, the problem of the relative difficulty to physically divide particularly small magnitudes due to the weakness of the dividing agent has nothing to do with the issue of the persistence of substantial (and accidental) forms into particularly small parts of a hylomorphic compound.

1.4.3. The Most Important Features of Averroes' Doctrine of the Continuity of Magnitudes and of Their (Potential) Infinite Divisibility

Trying to summarise, it is possible to claim that the most distinctive aspects of Averroes' doctrine of the continuity of magnitudes (also in comparison to the Late Ancient and Medieval Latin commentary traditions) are the following ones. First of all, Averroes fundamentally distinguishes the way in which the definition of continuity given by Aristotle in *Physics* V.3 applies to geometrical entities (where everything that is touching is necessarily contiguous and also necessarily continuous) and to "physical" magnitudes (where it becomes clear, at least in the *Long Commentary* on the *Physics*, that for two "physical" magnitudes to be contiguous, and *a fortiori* continuous, it is not sufficient that they are touching, but it is also necessary that they are of the same species, in accordance with Alexander and, partially, also with Simplicius). Averroes' rigorous distinction between the doctrine of continuity applying to geometrical entities and the one applying to "physical" magnitudes (to which one should also add the distinction between these two and the doctrine as applying to artificial entities) is, as I have said, probably the

quam tangat parvum. Et universaliter non possunt dicere quare parve sunt digniores ne dividantur quam magne."

[230] While, as seen in the second section of this chapter, Aristotle only remarked, in the passage, that it is easier to divide greater rather than smaller magnitudes (cf. *De generatione*, I.8, 326a26-28).

single most important aspect of his overall doctrine in terms of its influence on the Medieval Latin tradition. It is owing to this clear distinction that Averroes can specifically insist (bringing to completion an exegetical trend that started at least with Alexander of Aphrodisias) on the strong link between continuity and "essentialist" considerations in "physical" magnitudes. Specifically, Averroes, following Alexander, seems to be convinced that only "physical" magnitudes of the same species can be contiguous and *a fortiori* continuous.

Moreover, the distinction between the doctrine of continuity as applying to geometrical entities and to "enmattered" magnitudes allows Averroes to introduce, in the latter case, a further distinction between two different processes, that he calls '*continuatio*' and '*adunatio*' respectively. When two "physical" magnitudes become continuous, there is, according to Averroes, a first stage (the *continuatio*) during which the limits of the two entities involved become one, and a successive stage (the *adunatio*) during which the two entities become one. Such a distinction, so I believe, is best understood as evidence of the fact that the connection between continuity and unity established by Aristotle with particular strength in the *Metaphysics* still has an important role to play in Averroes' doctrine of continuity, certainly a more prominent role than the one it plays among Late Ancient commentators and also, as I will show below, than the one it plays in the Latin Middle Ages.

Nevertheless, Averroes also cements the relation between continuity and (potential) infinite divisibility (while, as the Late Ancient commentators, refusing to consider the problematic passage of *Physics* VI.2 as giving a definition of continuity in terms of (potential) infinite divisibility) in two ways. On the one hand, he brings to completion the idea, partially present in Late Ancient commentaries on the *Categories* and the *Metaphysics*, that the property of being divisible into parts that are further divisible represents the fundamental criterion to distinguish between continuous and discrete quantities. On the other hand, while Averroes does not include in his commentary on *Physics* VI.1 the references made by Alexander, Themistius and Simplicius to Epicurean atomism, which therefore did not reach the Latin West together with Averroes' commentaries, he reconstructs the two arguments presented by Aristotle in *Physics* VI.1 (and based on the premiss that continuity implies (potential) infinite divisibility) in a logically rigorous way, thus contributing to give prominence to such arguments in the

Medieval Latin tradition. The use of syllogisms in this context, although it will not be directly followed by Medieval Latin commentators, can be certainly put in parallel with the increasing use by Medieval Latin commentators, moving from the 13th towards the 14th century, of logical tools to capture the Aristotelian notion of (potential) infinite divisibility.

The notion of (potential) infinite divisibility, and its relation with continuity, however, is also dealt further in Averroes while commenting on the "atomistic dilemma" of *De generatione* I.2. In this respect, it is important to remark that Averroes provides (differently from Philoponus) a fundamentally correct interpretation of the dilemma. In particular, Averroes makes clear why the (potential) infinite divisibility of a continuous magnitude can never be actualised, neither by a "physical" nor even by a conceptual process of division, and regardless of whether the process of division is considered as simultaneous or successive (although Averroes, probably influenced by Philoponus, shows some initial hesitations in this respect). Averroes' correct interpretation of this chapter allowed Medieval Latin commentators to develop a fuller understanding of the notion of the (potential) infinite divisibility of continuous entities, and even, as said above, to express such understanding with the use of a wide array of innovative (most notably logical) conceptual tools.

1.5. Medieval Latin Commentators on the Continuity of Magnitudes and on Their (Potential) Infinite Divisibility

It would be excessively ambitious to try to provide, in the last part of this chapter, something like a comprehensive overview of the positions of Medieval Latin commentators of the 13th and the 14th centuries concerning the issue of the continuity of magnitudes and of their (potential) infinite divisibility[231]. Moreover, it would also lie fully

[231] For some important indications in this respect, useful starting points are: the first part of A. MAIER, *Kontinuum*, Minima, *und aktuell Unendliches*, in EAD., *Die Vorläufer Galileis im 14. Jahrundert (Storia e Letteratura 22)*, Roma, Edizioni di Storia e Letteratura, 1966 (the second part of Maier's chapter, dealing with *minima naturalia*, will be discussed in detail in the next chapter of the thesis), W. BREIDERT, *Das aristotelische Kontinuum in der Scholastik (Beiträge zur Geschichte der Philosophie und Theologie des Mittelalters. Neue Folge 1)*, Münster i.W., Aschendorff Verlag, 1970, and also ID., *Zum Masstheoretischen Zusammenhang zwischen Indivisibile und Kontinuum*, in A. ZIMMERMANN (ed.), Mensura. *Mass, Zahl, Zahlensymbolik im Mittelalter (Miscellanea Mediaevalia 16/1)*, Berlin-New York, NY, de Gruyter, 1983, pp. 144-152. See also, for an effective synthesis, J.E. MURDOCH, *Infinity and Continuity*, in N. KRETZMANN, A. KENNY, J. PINBORG (eds.), *The Cambridge History of Later Medieval Philosophy. From the Rediscovery*

beyond the scope of this thesis, insofar as, contrary to what is true of *minima naturalia* and *minima sensibilia*, the Medieval Latin commentators I focus on throughout this thesis share the same basic understanding of the continuity and of the (potential) infinite divisibility of magnitudes, although, of course, with important distinctions and specifications. Therefore, in this final part of the chapter I simply purport to provide an analysis of the positions on these issues held by some Aristotelian commentators who have a fundamental place in the subsequent chapters of this thesis, namely Albert the Great, Thomas Aquinas and John Buridan, together with the one expressed in his *Sentences* commentary by John Duns Scotus (who will also play a fundamental role in the following chapters). The choice to focus on such masters is, however, motivated also by further considerations. Not only, indeed, these four authors allow me to cover the chronological timeframe established in the thesis (i.e., ca. 1250-ca. 1350) in a rather complete and balanced way. What is more, they are also situated at critical doctrinal and historical junctures within it. Albert, concerning the continuity of magnitudes and their (potential) infinite divisibility as concerning many other issues, is a fundamental witness of the first reception of Aristotle's discussion around the mid-13th century. Aquinas' interpretation of the continuity of magnitudes and of their (potential) infinite divisibility represents a fundamental reference point for Aristotelian commentators of the last decades of the 13th century, even when his position is rejected or criticised. John Duns Scotus provides an extremely influential discussion of the continuity of magnitudes and of their (potential) infinite divisibility that will exert a fundamental influence on the subsequent debate since the early 14th century onwards. Finally, John Buridan is a key witness (and frequently a key actor) of most of the new doctrinal trends characterising the Parisian Faculty of Arts around the mid-14th century, and this is certainly the case for his analysis of the continuity of magnitudes and of their (potential) infinite divisibility.

1.5.1 Albert the Great

The first Medieval Latin commentator whose doctrine of continuity I analyse in this chapter is, therefore, Albert the Great (ca. 1200-1280). I will mainly take into account

of Aristotle to the Disintegration of Scholasticism, 1100-1600, Cambridge, Cambridge University Press, 1982, pp. 564-592. Some useful indications, although mostly focused on specific authors and debates, can also be found in KRETZMANN (ed.), *Infinity and Continuity in Ancient and Medieval Thought*, *op. cit.*

his commentaries on the *Categories* (dated to ca. 1252)[232], on the *Metaphysics* (dated between 1263 and ca. 1267)[233], on the *Physics* (dated between 1251/1252-1253)[234] and on the *De generatione*[235]. Before getting to the discussion of these single texts, however, a few general remarks are in order.

Indeed, Albert's discussion of continuity is marked by a high degree of originality, when compared with the previous Aristotelian commentary tradition, yet, at the same time, it also uniquely helps to put in focus some of the fundamental features that distinguish the Medieval Latin conception of continuity from the Late Ancient one and also (partially) from Averroes' own one. This originality is mostly due to three innovative elements, two clearly received through the mediation of the Islamic tradition, and one, instead, largely original and connected to some overarching topics of Albert's philosophy. The first of them, one which pervades Albert's discussion of continuity throughout the commentaries on the *Categories*, on the *Physics*, on the Pseudo-Aristotelian *De lineis indivisibilibus*[236], on the *Metaphysics*, and the commentary (now safely attributed to

[232] The commentary has been critically edited, most recently, in the so-called *Editio Coloniensis* as: ALBERTUS MAGNUS, *De Praedicamentis (Alberti Magni Opera Omnia, Editio Coloniensis, Tomus I Pars IB)*, ed. M. SANTOS NOYA, C. STEEL, S. DONATI, Münster i.W., Aschendorff Verlag, 2013.

[233] The commentary has been critically edited, most recently, in the *Editio Coloniensis* in two volumes: ALBERTUS MAGNUS, *Metaphysica. Libri I-V (Alberti Magni Opera Omnia, Editio Coloniensis, Tomus XVI Pars I)*, ed. B. GEYER, Münster i.W., Aschendorff Verlag, 1960, and ALBERTUS MAGNUS, *Metaphysica. Libri VI-XIII (Alberti Magni Opera Omnia, Editio Coloniensis, Tomus XVI Pars II)*, ed. B. GEYER, Münster i.W., Aschendorff Verlag, 1964. In what follows, I will not devote a specific analysis, however, to Albert's commentary on the passages relevant to continuity in the *Metaphysics*, especially Δ.6 and Δ.13. While, indeed, Albert's commentary on these chapters is of great theoretical importance, an analysis of these texts would have led me astray from the purposes of this chapter. In what concerns, indeed, Δ.6, Albert is focused on understanding in what way the one can be the essence (*quidditas*) of number, a topic to which he dedicates the two strictly interrelated digressions contained in *Metaphysica*, Book V, tr. I, cap. 8 and 10 respectively. For what concerns, instead, Δ.13, Albert focuses on the foundational issue of the essence of quantity and of the relation between quantity and substance (cf. esp. ALBERTUS MAGNUS, *Metaphysica*, Liber V, tract. III, capp. 2-3, ed. GEYER, p. 259, l. 15-p. 262, l. 29). I will, however, quote specific passages of this commentary, in what follows, whenever they are relevant to the discussion.

[234] The commentary has been critically edited, most recently, in the *Editio Coloniensis* in two volumes: ALBERTUS MAGNUS, *Physica. Libri I-IV (Alberti Magni Opera Omnia, Editio Coloniensis, Tomus IV, Pars I)*, ed. P. HOSSFELD, Münster i.W., Aschendorff Verlag, 1987, and ALBERTUS MAGNUS, *Physica. Libri V-VIII (Alberti Magni Opera Omnia, Editio Coloniensis, Tomus IV, Pars II)*, ed. P. HOSSFELD, Münster i.W., Aschendorff Verlag, 1993.

[235] The commentary has been critically edited, most recently, in the *Editio Coloniensis* as: ALBERTUS MAGNUS, *De natura loci. De causis proprietatum elementorum. De generatione et corruptione (Alberti Magni Opera Omnia, Tomus V, Pars II)*, ed. P. HOSSFELD, Münster i.W., Aschendorff Verlag, 1980.

[236] The commentary on this work, which Albert thought to be Aristotle's, is inserted between his commentary on Book VI and Book VII of the *Physics*, and it has therefore been edited in the *Editio coloniensis* as ALBERTUS MAGNUS, *Liber de lineis indivisibilibus*, in ID. *Physica. Libri V-VIII*, *op. cit.*, pp. 488-515.

him[237]) on the first four Books of Euclid's *Elements*[238], is his peculiar understanding of the "constitution" of geometrical objects[239]. The second one, instead, is his conception of the ontology of motion, which is explained in detail in Albert's commentary on the *Physics* (cf. esp. Book III, tr. I, capp. 3-4). The third element, instead, featuring particularly in the commentary on the *Physics* and in the one on the *De generatione*, is the distinctive interest Albert shows in discussing Democritean atomism, an aspect that, as I will show in the following chapters of the thesis, finds close counterparts both in his discussions of *minima naturalia* (in the *De generatione* commentary) and of *minima sensibilia* (in the *De sensu* commentary).

To see how these aspects bring Albert to adopt a distinctive (and innovative in some fundamental aspects) conception of continuity, the best starting point is his commentary on *Categories* 6. Discussing the kinds of continuous quantities presented by Aristotle in

[237] The main contrary opinion remains that of Busard (see esp. H.L.L. BUSARD, "Some Thirteenth Century Redactions of Euclid's *Elements*, with Special Emphasis on the Books I-V", *Archives Internationales d'Histoire des Sciences* 51, 2001, pp. 225-256.

[238] The attribution of the commentary, preserved only in ms. Wien, Dominikanerkloster 80/45, ff. 105r-145r (where it is explicitly attributed, in the upper margin of f. 105r, although in a hand likely distinct from the one who copied the text, to a certain 'Albertus' – "Primus Euclidi cum commento Alberti"), and edited in the *Editio coloniensis* as ALBERTUS MAGNUS, *Super Euclidem (Alberti Magni Opera Omnia, Editio coloniensis, Tomus XXXIX)*, ed. P.M.J.E. TUMMERS, Münster i.W., Aschendorff, 2014, to Albert, has been a longstanding matter of debate among scholars. A synthesis of the debate can be found in A. LO BELLO, *Albert the Great and Mathematics*, in I.M. RESNICK (ed.), *A Companion to Albert the Great. Theology, Philosophy and the Sciences (Brill's Companions to the Christian Tradition 38)*, Leiden, Brill, 2012, pp. 381-396 (the same scholar who authored an English translation of the commentary on Book I, based on a preliminary version of the critical edition of the same book: cf. ALBERT THE GREAT, *The Commentary of Albertus Magnus on Book I of Euclid's* Elements of Geometry *(Ancient Mediterranean and Medieval Texts and Contexts, Medieval Philosophy, Mathematics, and Science, 3)*, A. LO BELLO (trans.), Leiden, Brill, 2003). The extreme importance of the commentary lies, among other aspects, in the fact that it is the earliest extant Latin commentary on Euclid's *Elements*.

[239] A scholar who has devoted a considerable effort to the understanding of Albert's ontology of geometrical objects is Marco Aurélio Oliveira da Silva (cf. esp. M.A. OLIVEIRA DA SILVA, "Albert the Great on Mathematical Quantities", *Revista Portuguesa de Filosofia* 73 (3/4), 2017, pp. 1191-1202, and ID., "Movimento e objetos matemáticos em Alberto Magno", *Notae Philosophicae Scientiae Formalis* 3, 2014, pp. 23-31). In what follows I will take into account Oliveira da Silva's work, although his perspective is seriously vitiated by some important shortcomings, both textual and theoretical. From the textual point of view, he never takes into account Albert's discussion of the ontology of geometrical objects in *Categories* 6, and he devotes way too little space to the discussion in the commentary on *Physics* VI.1. From the theoretical point of view, while da Silva rightly notes that Albert's ontology of geometrical objects is explanatorily founded upon the concept of motion, he does not relate this aspect with Albert's own innovations in the ontological conception of "physical" motion. Moreover, da Silva does not give any role to Albert's distinction between a logical and an ontological level of analysis for what concerns geometrical objects. To these deficiencies I have tried to remedy in my own exposition in this section, while, of course, my focus remains that of Albert's understanding of continuity, rather than that of his ontology of geometrical objects.

the text (namely line, surface, body and, beyond them, place and time) Albert starts by analysing the case of line, and he notes the following:

> "It can indeed" by any [i.e., line] "be taken a" continuous "extremity, in which" all those which are "the particles" of a line under a single form of continuity "are joined". This common extremity, moreover, "is a point", from whose flowing (*fluxus*) in a continuum, or whose trait, produces a line. And therefore a line, although it cannot be divided in points, still cannot be divided if not in a point, because a line everywhere is substantially a point. I say 'substantially' from substance, which is almost [intended here as] matter. A point indeed extended or protended in a continuum is a line, whose very protension is quantity, and the protended substance [i.e., matter] is the point. And in this way a line is almost [made] of one substantial [i.e., material] subject, which is point, and from a formal one, which is the protension extended in a continuous [way], which is continuity, and this certainly is a line. And therefore, because everywhere the material substance of a line is a point, wherever a point is taken without separating it from the extension in a continuum, that point serves the function of an end and of a beginning: of an end, that is, in respect to what precedes it, and of a beginning in respect of what follows it. Therefore it is a common extremity of this conjunction of the preceding part [of the line] with the following one, and because the point is taken as indivisible, then all its mental and real extension in all the length of the substance preserves [the property of] indivisibility. For such reason a line is indivisible according to breadth and depth, and divisible only according to length, which not a point produces, but the extension of a point and [its] flowing in a continuum, because that extension determines the form of continuity, which in itself is always divisible[240].

Albert's exposition of the way in which the property of continuity applies to lines – a scheme which he will later extend in an analogical way also to surfaces and bodies respectively – is remarkable for various reasons. First of all, in agreement with some suggestions which are also present in Late Ancient commentaries on the *Categories* (suggestions that Albert could have derived from a close reading of Boethius'

[240] ALBERTUS MAGNUS, *De Praedicamentis*, tract. III, cap. 3, ed. SANTOS NOYA, STEEL, DONATI, *op. cit.*, p. 54, l. 50-p. 55, l. 15: "*Potest enim* a quolibet *sumi* continuus *terminus, ad quem* omnes, quae sub una forma continuitatis sunt *particulae* lineae, *copulantur*. Hic autem communis terminus *est punctum*, cuius fluxus in continuum vel ductus facit lineam. Et ideo linea quamvis in puncta non dividatur, tamen non potest dividi nisi in puncto, quia linea ubique substantialiter punctus est. 'Substantialiter' dico a substantia, quae est quasi materia. Punctus enim extensus sive protensus in continuum est linea, cuius ipsa protensio quantitas est, et substantia protensa est punctus. Et sic linea ex uno substantiali quasi subiecto est, quod est punctus, et ex uno formali, quod est protensio extensa in continuum, quod est continuatio, et hoc quidem est linea. Et ideo, quia ubique substantia lineae materialis est punctus, ubicumque sumatur punctus non absolutus ab extensione in continuum, illud punctum est in ratione finis et principii: finis quidem ad anterius et principii ad posterius. Communis ergo est terminus istius copulationis partis anterioris cum sequente per totum continuum, et quia punctum indivisibile positum, ideo tota intellectualis et realis eius extensio in tota longitudine substantiae servat indivisibilitatem. Propter quod linea secundum latitudinem et profunditatem est indivisibilis, sola divisibilis longitudine, quam causat non punctum sed puncti extensio et fluxus in continuum, quia illa extensio formam dat continuitatis, quae secundum seipsam divisibilis est semper."

commentary on *Categories* 6, where, as remarked above, they also feature), Albert interprets the role of points, as the extremities of two lines which come together to make them continuous, as the points of division of lines. Aristotle's perspective, which was focused, in the *Categories* and also in *Physics* V.3, on explaining how two entities come together so as to form a single continuous whole, is reversed: Albert's focus is rather on how a single continuous entity can be divided into two.

Nevertheless, apart from this "traditional" element, Albert's discussion of the continuity of lines (and of the nature of lines more generally) is extremely innovative. This is so in at least two elements. The first element is the interpretation of the point as the "material" principle of a line, complemented, in keeping with the hylomorphic language of the passage, by a "formal" principle, which is extension in one dimension, length, or, better said, *continuous* extension in one dimension. As I will show throughout this section, the use of a hylomorphic language to discuss about the role of points in lines is a distinctive feature of Albert's understanding of geometrical magnitudes, and of their continuity. Although, as I will show below, Albert provides a more thorough discussion of this aspect in other passages, what remains constant in his reasoning in this respect is the fact that, according to Albert, although points are never taken by Albert to be the quantitative parts of a line, still they are taken to be *essential* parts of it. Evidently, therefore, Albert's conception of the point is rather different from Aristotle's own one. Aristotle, as seen, never interpreted points as being more than the limits of lines (something which is especially clear in the "atomistic dilemma" of *De generatione* I.2). It is therefore all the more surprising that Albert speaks of points not only as having an autonomous ontological characterisation, but, what is more, as being the "(*quasi*) matter" of a line[241].

Albert's insistence on the essential role of points in the composition of a line emerges also from the second element of originality of the passage. Indeed, Albert claims that a point "produces" a line by its flowing, i.e., by its movement, availing himself of terms such as *fluxus*, *ductus*, *protensio* or *extensio* of a point. All these terms belong to

[241] Something like a substantial (and even extended) point has been found, in the third section of this chapter, in fr. 100 Wehrli concerning Eudemus, as mentioned by both Themistius and Simplicius (and later, in the fourth section, by Averroes).

the semantic field of motion[242]. Therefore, Albert seems to be suggesting that a line can always be seen as[243] what is produced by the movement of a point (call it C) between two limits (call it A and B), and the continuity of a line depends on the fact that, at any point during the motion (call it D), it is possible to divide the motion itself into the "distance" already covered by C (i.e., AD) and into that still to be covered in order to finish the motion (i.e., DB). All these considerations, as it should be clear by now, do not find any counterpart in Aristotle's discussion of geometrical magnitudes and of their continuous structure.

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[242] And so does as well the word *terminus*, by which Albert refers to the 'limits', or, as I have translated, the 'extremities', of a line which are points.

[243] That here Albert is talking only of a mental imagination, rather than making a concrete ontological claim concerning continuous magnitudes, is confirmed by a passage from the same chapter of the commentary: "Sed forma lineae est continuitas in longum et illa est a fluxu *intellectuali* puncti in continuum" (ALBERTUS MAGNUS, *De Praedicamentis*, tract. III, cap. 3, ed. SANTOS NOYA, STEEL, DONATI, p. 55, ll. 70-72). The expression *intellectualis fluxus* occurs other two times in the same chapter (cf. *ibid*., p. 56, l. 3 and l. 8). More in general, Albert is keen on clarifying that the notion of "motion" as applied to geometrical objects he makes use of is to be understood merely as referring to an *imagined* motion. The same perspective is also made clear in a vehement way in Albert's commentary on *Metaphysics* Δ.13: "Quod autem quidam dicunt de motu puncti, quod motu suo constituit lineam et linea motu suo superficiem, quando non movetur ad punctum, sed ad longitudinem totam simul in continuum, et <si> superficies movetur in profundum, constituit corpus: penitus est frivolum, quia punctus non movetur et similiter nec linea neque superficies neque corpus mathematicum, sicut bene ostensum est in praehabitis. Talia ergo dicta sunt secundum imaginationem solam, et non secundum rei naturam" (ALBERTUS MAGNUS, *Metaphysica*, Liber V, tract. III, cap. 2, ed. GEYER, p. 260, ll. 15-24; note incidentally that the use of the notion of *corpus mathematicum* by Albert in the passage is of great interest (see the considerations on it that will be put forth in Chapter 2 in connection with its use by Thomas Aquinas and those that will be put forth in Chapter 4 in connection with its use by John of Jandun). This also explains how Albert can be consistent with Aristotle's clear distinction between mathematics and physics (cf. *Physics* II.2), which relies explicitly on the fact that mathematics studies sensible objects abstracting from matter *and movement (including motion)*, and therefore its objects, insofar as they have an autonomous ontological characterisation, are deprived of matter and movement. For what concerns Albert's more general position concerning the continuity of sensible magnitudes, for him, as for Averroes before him, it makes no sense to claim that a certain quantitative property applies to mathematical entities but not to sensible ones. It is, rather, the case that such properties apply to mathematical entities essentially, since mathematical entities are essentially quantitative, and to sensible ones only accidentally, insofar as quantity is only an accident of sensible substances. Albert does, however, mention a possible exception to this statement (i.e., light), although he does not take a definitive stance on the issue: "Non autem moveat quemquam quod hoc dicimus fieri secundum intellectum, cum in hoc libro loquamur de decem generibus ut primis rerum principiis, ad quae omnia praedicabilia reducuntur. Omnia enim abstracta et mathematica sunt accepta secundum intellectum. Secundum enim esse in natura, haec vel non inveniuntur vel, si inveniantur, hoc non est nisi in sola luce, ut quidam dicunt, quamvis dictum eorum philosophis non concordet. Quamvis ergo ista accepta sint secundum intellectum, iste tamen intellectus a substantialibus rei causatus est et ad esse refertur, quia dicit naturam et esse rei, ut est hoc quod est et ut est significata per nomen, quod est notio praedicabilis. Et ideo dicit Aristoteles quod sic 'abstrahentium non est mendacium'. Quinimo est certissime verum, quamvis secundum esse ista non inveniantur distincta in natura. Insunt enim hoc modo, quo determinata sunt in ipsa substantia quantorum" (ALBERTUS MAGNUS, *De Praedicamentis*, tract. III, cap. 3, ed. SANTOS NOYA, STEEL, DONATI, p. 56, ll. 19-36). Likely the reference to the *quidam* who believe that light is essentially identical to mathematical entities is aimed at Grosseteste's *De luce et inchoatione formarum*, as the editors of Albert's commentary rightly point out (*ibid*., p. 56), but there is no explicit mention of Grosseteste anywhere in this chapter.

Instead, both the conception of points as the "(*quasi*) matter" of lines and this "dynamical" understanding of the continuity of (geometrical) magnitudes (what has been called Albert's 'doctrine of flux') become far more intelligible once it is recognised that they are clearly influenced by the geometrical tradition stemming from Euclid's *Elements*, in the translation by Adelard of Bath, Pseudo-Aristotle's *De lineis indivisibilibus*, and al-Nayrizi's extremely influential Arabic commentary on Books I-X of the *Elements*, as translated by Gerard of Cremona[244]. Such tradition talked of lines as being "drawn" (i.e., constructed) by conjoining two points, either with a straight movement, or with a curved one, giving rise, respectively, to a straight or a curved line. In the same way, a surface, according to the geometrical tradition, can be drawn by conjoining two lines, and a three-dimensional body by conjoining two surfaces[245]. It is only in the context of this tradition, therefore, that the essential role of points in lines and the 'doctrine of flux' find their proper place. The fact that Albert links the interpretation of Aristotle's discussion of the continuity of magnitudes with significant features of the ancient and Islamic geometrical tradition ultimately stemming from Euclid's *Elements* is in itself a remarkable aspect, one which fundamentally connotes the Medieval Latin discussion of the continuity of magnitudes.

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[244] A commentary which has been critically edited as ANARITIUS, *The Latin Translation of Anaritius' Commentary on Euclid's* Elements of Geometry, *Books I-IV (Artistarum Supplementa 9)*, P.M.J.E. TUMMERS (ed.), Turnhout, Brepols, 1994. An English translation of the commentary on Book I has appeared as: AL-NAYRIZI, *Gerard of Cremona's Translation of the Commentary of al-Nayrizi on Book I of Euclid's* Elements of Geometry. *With an Introductory Account of the Twenty-Two Early Extant Arabic Manuscripts of the* Elements *(Ancient Mediterranean and Medieval Texts and Contexts, Medieval Philosophy, Mathematics, and Science 2)*, A. LO BELLO (trans.), Leiden, Brill, 2003. A very clear formulation of this claim (based on a distinction between the "static" model of Aristotelian geometry and the "dynamic" one based on Euclid's *Elements*) is the one that can be found in BREIDERT, *Das Aristotelische Kontinuum in der Scholastik*, *op. cit.*, p. 28: "Diese Auffassung der Linie zeigt, daß Albertus in der Behandlung der Kontinua nicht von der aristotelischen Konzeption der Geometrie als einer Wissenschaft von statischen Gebilden ausgeht, sondern von einer kinetischen oder generativen Vorstellung dieses mathematischen Bereiches, wie sie Proklos bei seiner Euklidinterpretation verwendet."

[245] Cf., for instance, the following passage form al-Nayrizi's commentary on Book I of Euclid's *Elements*: "Linea quoque cum se moverit, si fuerit eius motus sequens motum puncti, augebit solam sui longitudinem tantum; linea enim non fit nisi ex motu puncti. Si autem linea in se ipsa moveatur et de suo situ primo ad alium situm fuerit mota, accidit ex sua remotione alia dimensio que vocatur latitudo, et provenit ex ea quantitas habens duas dimensiones que vocatur superficies, eo quod sit sicut illud quod super corpora est expansum et est illud quod ex corporibus videtur. Superficies quoque si moveatur linee sequens motionem, augebit se solam tantum. Si autem tota moveatur a suo primo situ ad alium situm, provenit dimensio tertia que vocatur profunditas, et fit ex ea corpus, quod, cum sit tres habens dimensiones, undique a superficiebus comprehenditur" (quoted in OLIVEIRA DA SILVA, "Albert the Great on Mathematical Quantities", *op. cit.*, pp. 1194-1195, n. 7).

Still, as said above, the innovations of Albert's doctrine of the continuity of magnitudes go far beyond this first aspect. Indeed, Albert's peculiar understanding of the continuity of geometrical (and, derivatively, of sensible) entities is also connected with his conception of motion, the second element of originality I mentioned above, and, as said, another one fundamentally indebted to the Islamic tradition. Indeed, trying to answer the difficult problem of the categorisation of motion, in his commentary on the *Physics* (cf. esp. Liber III, tract. I, capp. 3-4), Albert, influenced by Avicenna, leans towards the idea that motion is the flowing of a form from one point to another, a form which is essentially identical both to its starting point and to its ending point[246]. According to this understanding, the motion of a point, in a sense, is not essentially different from the moving point itself, since it is nothing over and above the moving (flowing) point. As a consequence, in Albert's peculiar perspective, magnitude and motion are not fundamentally distinguished, although, of course, insofar as motion *is* something (i.e., the

[246] The debate on Albert's position concerning motion is a longstanding one, which goes back at least to a series of contributions by one of the pioneers of the study of Medieval Scholastic natural philosophy, Anneliese Maier (cf. A. MAIER, *Die Wesensbestimmung der Bewegung*, in EAD., *Die Vorläufer Galileis im 14. Jahrundert. Studien zur Naturphilosophie der Spätscholastik*, Roma, Edizioni di Storia e Letteratura, 1949, pp. 9-25; EAD., Motus est actus enim in potentia..., in EAD., *Zwischen Philosophie und Mechanik*, Roma, Edizioni di Storia e Letteratura, 1958, pp. 3-57, and, finally, EAD., Forma Fluens *oder* Fluxus Formae? in EAD., *Zwischen Philosophie und Mechanik*, *op. cit*., pp. 61-143). Now, Maier's position, with a gross oversimplification, is that Albert was the first Latin commentator to positively address the issue of the categorisation of motion. Torn between Avicenna's position, according to which motion is a *forma fluens* (although Jon McGinnis has argued that Albert miscategorised Avicenna's own position, which is best understood, rather, as an analysis of motion at an instant: see J. MCGINNIS, "A Medieval Arabic Analysis of Motion at an Instant: the Avicennan Sources to the *Forma Fluens*/*Fluxus Formae* Debate", *The British Journal of the HIstory of Science* 39 (2), 2006, pp. 189-205), and Averroes' one according to which it is rather a *fluxus formae*, in Book III, tract. I, cap. 3 of his *Physics* commentary he resolved to accept the latter, giving rise to a series of unsolvable theoretical difficulties still fully visible up to the time of William of Ockham, who went to the point of denying the reality of motion. Since Maier, the debate has progressed considerably, and, after the fierce criticisms of decades of scholarship (cf. for instance E.J. MCCULLOUGH, *St. Albert on Motion as* Forma fluens *a*nd Fluxus formae, in J.A. WEISHEIPL (ed.), *Albertus Magnus and the Sciences: Commemorative Essays 1980*, Toronto, Pontifical Institute of Mediaeval Studies, 1980, pp. 129-154, esp. p. 130, C. WAGNER, "Alberts Naturphilosophie im Licht des neuern Forschung (1979-1983)", *Freiburger Zeitschrift für Philosophie und Theologie* 32 (1/2), 1985, pp. 65-104, and J.A. WEISHEIPL, *The Interpretation of Aristotle's* Physics *and the Science of Motion*, in KRETZMANN, KENNY, PINBORG (eds.), *The Cambridge History of Later Medieval Philosophy*, *op. cit.*, pp. 521-536, esp. p. 528), it is certainly not possible to accept her position unqualifiedly (it is a separate question whether these criticisms were truly addressing Maier's original position or rather a series of convenient strawmen...). Still, the fundamental idea that motion, while having a formal aspect of itself, is ontologically dependent on a moving form which is essentially identical to those of the starting and the ending point (thus a characterisation certainly closer to a *fluxus formae* than to a *forma fluens*) seems to be ultimately acceptable. See on this S. BALDNER, "Albertus Magnus and the Categorization of Motion", *The Thomist: A Speculative Quarterly Review* 70 (2), 2006, pp. 203-235, and the quotations contained therein. Incidentally, I believe that Albert's "dynamical" analysis of the continuity of magnitudes in the commentary on *Categories* 6 has been rather neglected in this debate, something which is to be particularly regretted, since such an analysis can help clarifying Albert's position to a significant extent.

flowing, *fluxus*, itself), it is something distinct from the moving magnitude[247]. It is only thanks to this "minimalist" ontological characterisation of motion that it is possible to use the concept in the analysis of geometrical objects, which are, by Aristotle's definition, abstracted from both matter and all sorts of change (including local motion).

Yet, Albert is keen on making these conceptual innovations fully compatible with Aristotle's doctrinal framework[248]. The only definition of a point that Albert provides is that of the extremity at which two parts of a line join[249]. In this sense it is to be understood Albert's commitment to rebutting the idea that a point can be meaningfully said to be a (quantitative) part of a line. How, then, can a point be considered an essential part of a line, if it is nothing more than a limit? To find an answer to this question, one can turn both to Albert's commentary on *Categories* 6 and to his commentary on *Physics* VI.1. Nevertheless, the best and more complete explanation is the one to be found in the commentary on *Physics* VI.1 (Book VI, tr. I, cap. 1) which also helps understanding in what sense, in the commentary on *Categories* 6, Albert speaks of the point as the "(*quasi*) material" principle of a line, and of extension in one dimension as the "formal" principle of it:

> The whole difficulty comes back to knowing in what way a point is in a line, and in what way the 'now' in time. Aristotle indeed in the *Posterior Analytics* [cf. *Posterior Analytics*, I.4, 73a34-37] appears to say that a point is in three different ways in relation with a line, if someone wants to collect his words [on this subject]. Indeed, he [Aristotle] says that a line is of points. He also says that a point is the substance posited in the line. And, thirdly, he says that the point is in the definition of the line.

[247] It is telling that, in the context of the analysis of motion, Albert frequently quotes the example of the drawing of a line: "If we imagine that a flowing point makes a line and that the flowing point stops at some point that is the termination of its flowing, it is clear that the extremity (*terminus*) of the line, in which the flowing point rests, is intrinsic and essential to the line; and we cannot say that the point terminating the flow is of a different essence from the flowing point, although the being of the flowing and of the standing points are different" (cf. ALBERTUS MAGNUS, *Physica*, Liber III, tract. I, cap. 3, ed. HOSSFELD, p. 152, l. 85-p. 153, l. 4: "Adhuc autem, si nos imaginemur puncti fluxum facere lineam et terminari fluxum puncti in aliquo puncto, ubi terminatur fluxus eius, constat, quod terminus lineae, in quo stat fluxum puncti, intrinsecus est et essentialis lineae; et non possemus dicere, quod punctus terminans fluxum esset alterius essentiae quam punctus fluens, sed esse est aliud fluentis et stantis per modum termini"; translation taken from BALDNER, "Albertus Magnus and the Categorization of Motion", *op. cit.*, p. 219, slightly modified; the same example, as Baldner also remarks (*ibidem*) is used by Albert, in the same chapter, also at p. 155, ll. 56-64.

[248] While also making it compatible, at least apparently, with Plato's claim that "substantia corporis secundum id quod est, est superficies, sicut punctum est substantia lineae et linea substantia superficiei" (p. 55, ll. 51-53), a doctrine which albert could have taken both from Aristotle's *Physics*, I.4, 209b5-17, and from Plato's *Timaeus*, 49Dff.

[249] Albert's definition is that of a *communis terminus copulationis* of two lines (cf. for instance, ALBERTUS MAGNUS, *De Praedicamentis*, tract. III, cap. 3, ed. SANTOS NOYA, STEEL, DONATI, p. 55, ll. 33-34).

And therefore where he provides an example of the first way of that which is *per se*, i.e., when the predicate falls in the definition of the subject, he inserts as example the way in which a point is in the definition of a line. And it cannot be said that all those [things] are said according to the opinions of others [i.e., the atomists], who say that a line is composed of points and who say that the principles of bodies are points, such as Democritus and Leucippus, because according to this [opinion] also this claim would not be unqualifiedly true, i.e., that a point is not in succession to a point in a continuum, but it would be true according to the opinion of Democritus and Leucippus, who say that a line is composed of points, and according to this the abovementioned demonstration would be useless. In general therefore we have to determine in what way a point is in a line and whether it is a substance or an accident, and whether it is something of the line. It seems therefore that it must be said that a point, such as a line, can be considered in two ways, i.e., according to the being that it has in matter, or according to its principle of definition, according to which it is not conceived with matter, such as not even with quantity. If thus it is taken according to being, there is little doubt that it is in matter such as an accident in a subject. Indeed matter, as Aristotle claims [cf. *De generatione et corruptione* I.5, 320b14-16], and as we have exposed above, is neither a point, nor a line, but that of which those are the limits. And so a point has a position or it is caused by matter, such as the other accidents. And matter is its substrate, in that it is indivisible according to itself, and it can be divided according to the quantity which it acquires. And the proximate subject of a point is not mere prime matter, but rather that which already begins to be a principle of quantity, and tends towards potency. Hence if there is some matter of intellectual substances, that is prior to the one which is the proximate subject of a point. Indeed, even though the point in this way is an accident, such as a line and a surface, still if it is considered in an absolute way and according to [its] definition, it is not an accident of the line, but something proper to its substance in such a way in which [something] that falls in the definition of a thing is called a 'substance'[250].

[250] ALBERTUS MAGNUS, *Physica*, Liber VI, tract. I, cap. 1, ed. HOSSFELD, p. 447, l. 58-p. 448, l. 32: "Redit autem tota difficultas ad hoc, ut sciatur, qualiter punctum est in linea et qualiter nunc in tempore. Aristotelem enim in *Posterioribus* videtur dicere, quod punctum tripliciter se habet ad lineam, si quis velit colligere verba eius. Dicit enim, quod linea est ex punctis. Dicit etiam, quod punctum est substantia posita in linea. Et dicit tertio, quod punctus est in diffinitione lineae. Et ideo ubi exemplificat de primo modo eius quod est per se, scilicet quando praedicatum cadit in diffinitione subiecti, ponit exemplum sicut punctus in lineae diffinitione. Nec potest dici, quod omnia illa dicta sint secundum aliorum opiniones, qui dicunt lineam componi ex punctis et qui dicunt principia corporum esse puncta sicut Democritus et Leucippus, quia secundum hoc etiam iste locus non esset simpliciter verus, scilicet quod punctus non est consequens ad punctum in continuo, sed esset verum secundum opinionem Democriti et Leucippi, qui dicunt lineam componi ex punctis, et secundum hoc demonstratio inducta non valeret. Universaliter igitur oportet nos determinare, qualiter punctus sit in linea et utrum sit substantia vel accidens et utrum sit aliquid lineae. Dicendum igitur videtur, quod punctus sicut et linea dupliciter potest accipi, scilicet secundum esse, quod habet in materia, aut secundum diffinitivam rationem ipsius, secundum quam non concipitur cum materia sicut nec quantitas. Si autem secundum esse accipitur, procul dubio in materia est sicut accidens in subiecto. Materia enim, ut dicit Aristoteles et nos ut supra exposuimus, nec est punctum nec linea, sed est id cuius haec sunt ultima. Et sic punctum ortum habet vel causatur a materia sicut et alia accidentia. Et materia subicitur ei, eo quod ipsa de se impartibilis est et potest esse partibilis per quantitatem, quam acquirit. Et proximum subiectum puncti non est prima materia simplex, sed potius illa quae iam incipit esse principium quantitatis et inclinatur ad potentiam. Unde si aliqua est materia intelligentiarum, illa est ante eam quae est proximum puncti subiectum. Licet autem punctus hoc modo sit accidens sicut et linea et superficies, tamen si absolute secundum diffinitionem accipitur, non est accidens lineae, sed aliquid de substantia eius hoc modo quo substantia dicitur, quod cadit in diffinitione alicuius."

The passage, as said, finds a counterpart in Albert's commentary on *Categories* 6[251], although, as explained above, the text from the *Physics* commentary is certainly more developed. Albert starts by making reference to the three ways in which a point can be in a line according to Aristotle's *Posterior Analytics* (i.e., insofar as a line is made of points, as points are the substance in the line, and as points are in the definition of a line). Now, this reference allows him first of all to distinguish his own position from the one which he attributes to Leucippus and Democritus, according to which a line is composed of points (i.e., points are quantitative parts of a line). This is an opinion which he firmly rejects. Nevertheless, Albert also believes that this does not make it impossible to claim that a point is, in some way, part of a line.

Here Albert introduces – focusing on the ontological plane of the discussion[252] – a hylomorphic framework, by referring, again, to the notions of the matter and the form of a line, the latter internally distinguished between the substantial and accidental forms of a line. Now, as seen above, in the commentary on *Categories* 6 Albert spoke of points as *quasi* being the material principle of a line. Here, he qualifies this definition by making it clear that the material substrate of a line is not composed of points, rather of the matter of those sensible entities from which a line is abstracted and, once the line is abstracted by the mind, by something close to prime matter (an intellectual, or "spiritual", matter of sorts), but a matter already inclined towards receiving quantity (what I think can be qualified as "pure extensionality")[253]. Indeed – and here Albert turns to the logical plane

[251] ALBERTUS MAGNUS, *De Praedicamentis*, tract. III, cap. 7, ed. SANTOS NOYA, STEEL, DONATI, p. 63, l.45-p. 64, l. 6: "Dicendum enim pro certo quod linea forma est et non habet materiam, ex qua sit, sed habet materiam, in qua sit, et ideo quaestio nulla est. Si autem sic formatur quaestio: quid habeat linea pro substantia secundum id quod est, et quid pro formali principio? tunc quaestio valet. Et quod dicatur quod partes lineae sunt in ea ut substantia materialis, omnino est impossibile et stultum dicere, quia, sicut obiectum est, partes lineae sunt lineae, et oporteret de illis idem quaerere. Unde hoc stultum est dicere. Sed dicendum quod, sicut in tempore substantia temporis est nunc, ita in linea mathematice per intellectum generata et constituta substantia lineae punctum est fluens in continuum, et sicut esse temporis fluens successio est, ita in linea esse formale lineae est continuitas circa puncta copulantia posita per fluxum puncti intellectualem. Cuius probatio quod id est formale principium in quolibet, per quod ponitur in specie sui generis; linea autem ponitur in spece quantitatis per longitudinis continuum, longitudinis igitur continuum est forma ipsius. Continuum autem non fit nisi ad unum communem terminum copulatione, et copulatio non fit nisi fluxu extenso. Fluxus ergo intellectualis puncti facit continuum in linea, et punctum est substantia ipsius. Et hoc est verum. Et dicere quod punctum <est> forma et partes materia, est deliramentum. Nec punctum nisi fluens ponitur in diffinitione lineae, secundum quod linea est, sed ponitur in diffinitione lineae rectae et finitae; finita enim et recta linea est longitudo, 'cuius medium non exit ab extremis', cuius extrema sunt duo puncta."

[252] Here I interpret Albert's reference to the *esse quod (sc. punctus) habet in materia* as meaning the 'existence' that a point has in matter.

[253] Yet Albert also clarifies that points, even if they are not the material principle of a line, are the first elements having position in it, since the position of any part of a line depends on the identification of the

of the discussion – lines can only be defined as the result of the movement of a point between two points intended as limits, and, insofar as they appear in the definition of lines, points can be meaningfully said to be a "substantial (or, better said, essential)" part of lines.

It is only at this point, however, that Albert draws the conclusion of his whole analysis, arriving at his original characterisation of the definition of continuity itself:

> In a continuum indeed two things are necessary, namely, the continued (*continuatum*) and the continuing (*continuans*), and the continued is certainly a part of the continuum, but the continuing cannot be a part of it, otherwise, indeed, the continued and the continuing would be the same thing; thus, the first continuing is the point. And therefore a point is in a line in three ways, namely as the beginning and as the medium and as the end. And according to the fact that it is the beginning [of the line], so from it the first continuum, which is the line, flows, in such a way that its motion – which can be imagined to be permanent in the process [of moving] – makes the line, in the way which we have mentioned above. And so it is said that the line is composed of points, certainly not such as parts, but such as those from which derives its indivisibility through the whole length. According, then, to the fact that it is the medium, so it is that which continues the parts, and so it always falls between the two points which enclose a line, and therefore two points can never be consecutive to each other. And according to the fact that it is an end, continuity is towards it such as the end of the continuum. It appears therefore that a point is in a line as its cause and form. But the form is an essential part, and not a quantitative one, and therefore by some – not irrationally, in my opinion – it has been conceded that the point is an essential part of a line, not, however, a quantitative [one]. And, indeed, it is not necessary that everything which is the form of a thing is predicated of the thing, because the substantial form (*forma faciens esse*) is not predicated [of the thing of which it is the substantial form], and the form, insofar as it is a form, is not predicated of that of which it is a form, as Avicenna testifies[254], but it is predicated in that it is a form and the same or one either in genus, or species, or number. So therefore it is already clear in what way a point is that which is a substance located in a continuum, because it is the first substance of the continuum which has position in it and which falls in its definition, such as what begins and what continues and what ends a continuum, all things which are the act of a form. And it is clear in what way a point is not in succession to a point and in what way it is an accident of the matter and the substance of a line, and all the things that are asked about the point, have already been clarified[255].

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points which are its limits. Therefore, in this extremely qualified sense, points are still a *quasi* material principle of a line.

[254] Here Albert is clearly referring to Avicenna's doctrine of the indifference of the essence. On Albert's reception of this doctrine in his theory of the universals, see A. DE LIBERA, "Théorie des universaux et réalisme logique chez Albert le Grand", *Revue des Sciences philosophiques et théologiques* 65 (1), 1981, pp. 55-74.

[255] ALBERTUS MAGNUS, *Physica*, Liber VI, tract. I, cap. 1, ed. HOSSFELD, p. 448, ll. 32-67: "In continuo enim duo sunt necessaria, scilicet continuatum et continuans, et continuatum quidem est pars continui, sed continuans non potest esse pars eius, aliter enim idem esset continuatum et continuans; unde primum continuans est punctus. Et ideo punctus tripliciter est in linea, scilicet ut principium et ut medium et ut finis. Et secundum quod est principium, sic ab eo fluit continuum primum, quod est linea, eo quod motus eius

Albert's analysis, which, it is to be remarked, applies not only to the definition of line specifically, but rather of continuous quantities more generally, and therefore applies equally to geometrical and "enmattered" ones, in respect of their limits, is first of all remarkable in that it is drafted in logical terms. This is another (methodologically) innovative aspect of Albert's analysis of continuity, which will emerge even more prominently when I will investigate his own conception of (potential) infinite divisibility in his *De generatione* commentary. Nevertheless, it is important to remark from the outset that, while finding a partial precedent in Averroes, the role of logical analysis in the study of the continuity of magnitudes and of their (potential) infinite divisibility is a defining feature of Scholastic Aristotelianism.

In the passage just quoted, Albert starts by remarking that the definition of an entity as continuous is based on a distinction between the subject (the *continuatum*) and the predicate (the *continuans*). By *continuatum*, Albert refers to the extension of the continuous quantity considered, while the *continuans* is that which can be imagined to move over such extension. More specifically, the *continuans*, in Albert's view, is the limit of any given continuous quantity, which can be imagined to move from one extreme to the other of the extension represented by the quantity considered.

In the case of magnitudes, and, more specifically, of a line (call it AB), the *continuatum* is the total length of AB, while the *continuans* is another point (call it C) which one imagines moving from A to B, and which is essentially identical to both. In this way, points appear in the definition of a line as the *principium* (A), *medium* (C) and

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imaginabilis permanens in processu facit lineam, quemadmodum diximus supra. Et sic dictum est, quod linea est ex punctis, non quidem sicut ex partibus, sed a quibus est indivisibilitas eius per totam longitudinem. Secundum autem quod est medium, sic est continuans partes et sic cadit semper inter duo puncta lineam terminantia, et ideo numquam possunt esse consequentia se duo puncta. Et secundum quod est terminus, continuatio est ad ipsum ut ad finem continui. Patet igitur, quod punctus est in linea sicut causa eius et forma. Sed forma est pars essentialis et non quantitative, et ideo a quibusdam meo iudicio non irrationabiliter concessum est punctum esse partem lineae essentialem, non autem quantitativam. Neque enim oportet, quod omne quod est forma rei, de re praedicatur, quia forma faciens esse non praedicatur, nec forma, inquantum forma est, praedicatur de eo cuius est forma, ut testatur Avicenna, sed praedicatur, prout est forma et idem sive unum genere vel specie vel numero. Sic ergo iam patet, qualiter punctum est id quod est substantia posita in continuo, quia ipsum est prima substantia continui habens positionem in ipso et cadens in diffinitione ipsius sicut principians et continuans et terminans continuum, quae omnia sunt actus formae. Et patet, qualiter punctum non consequitur punctum et qualiter est accidens materiae et substantia lineae, et omnia quae de puncto quaeruntur, iam facta sunt plana." For an important analysis of this passage, and especially of Albert's distinction between a point as *principium*, *medium* and *finis* of a line, see also BREIDERT, *Das Aristotelische Kontinuum in der Scholastik*, *op. cit.*, pp. 28-29.

finis (B) of its (continuous) length. They act, Albert does not hesitate to say, as the *causa* and the *forma* of a line insofar as it is a magnitude, and this not because they are its substantial form (that is rather represented by its continuous extension in one length), but because it is the movement of a point, between two points, which is the (formal) cause of the substantial form of a line. This claim seems to be at odds with respect to the one, quoted above, from Albert's commentary on *Categories* 6, where it was said that the point is rather *quasi* a *material*, not a formal, principle of a line. Yet, the two statements need not be in opposition. Albert's solution to this issue can be found in his commentary on *De generatione et corruptione* I.2:

> Moreover it must be observed that every quantity flows from an indivisible[256], such as we have remarked: if, indeed, the flowing of the point is considered essential, without doubt it will constitute a line, and the line a surface, and the surface a body: and therefore everywhere in a line there is a point potentially, and a line everywhere in a surface, and a surface everywhere in a body potentially: and therefore a point has a double relation with a line: if, indeed, the line is considered as the essential flowing of a point, the point is a material part or the matter of it [i.e., of the flowing], and similarly the line of a surface, and the surface of a body. If, however, the line is considered according to its form such as by Euclid it is said [cf. *Elementa*, I.1, def. 2.3], i.e., a length terminated at two points, so the two points [i.e., the two limits of the line] are formally in the line according to the act of [their] form, which is to terminate and to end: and so the point in some way is the form of the line[257].

[256] This is not the appropriate place to try to determine why Albert insists on the idea that *omnis (continuous) quantitas fluit ab indivisibili*. Nevertheless, one suggestion worth examining is that this idea might be linked with Albert's effort to curb Aristotle's conception of continuity so as to make it compatible with the idea that every continuous structure in nature has an (indivisible) starting point (and also an indivisible endpoint), an idea which, of course, was pivotal in making Aristotle's conception of continuity compatible with the dogma of the temporal creation of the world. On this aspect of Albert's interpretation of Aristotle's conception of continuity in relation with the polemics concerning the Aristotelian doctrine of the eternity of the world, see especially A. CORTABARRIA, "La eternidad del mundo a la luz de las doctrinas de San Alberto Magno", *Estudios Filosoficos* X, 1961, pp. 5-39, esp. p. 12, and L. BIANCHI, *L'errore di Aristotele. La polemica contro l'eternità del mondo nel XIII secolo (Pubblicazioni della Facoltà di lettere e Filosofia dell'Università di Milano CIV)*, Firenze, La Nuova Italia, 1984, esp. p. 46. More in general, it seems important to remark that Albert's overall analysis of continuity seems to be primarily aimed, in an implicit way, at the case of time.

[257] ALBERTUS MAGNUS, *De generatione et corruptione*, Liber I, tract. I, cap. 15, ed. HOSSFELD, p. 124, ll. 6-20: "Amplius observandum, quod omnis quantitas fluit ab indivisibili, sicut praenotavimus: si enim fluxus puncti essentialis accipiatur, absque dubio lineam constituet, et linea superficiem, et superficies corpus: et ideo ubique in linea est punctum potentialiter, et linea ubique in superficie, et superficies ubique in corpore potentialiter: et ideo punctum dupliciter se habet ad lineam: si enim linea consideretur ut essentialis fluxus puncti, punctum est pars materialis vel materia ipsius, et similiter linea superficiei, et superficies corporis. Si autem linea formalis accipiatur prout ab Euclide dicitur scilicet longitudo terminata ad duo puncta, sic duo puncta formaliter sunt in linea secundum actum formae qui est terminare et finire: et sic punctum aliquo modo est forma lineae."

The passage makes clear that for Albert a point can be both considered a material, and a formal aspect of a line. Material, insofar as, especially according to Albert's conception of motion, it is what underlies (i.e., the substrate of) the *fluxus* which, in imagination, produces a line (the *medium*, i.e., the point C, in the example above). Formal, insofar as the form of a line (i.e., its continuous extension in one dimension) is defined according to points, specifically by the two which act, as *principium* and *finis* respectively, as limits of the line itself (points A and B in the example above). Yet, as it should be clear from the passage quoted above, a point, strictly speaking, is neither the matter of a line, nor its substantial form (which is, as said, its length, i.e., its continuous extension in one dimension – which, be it said incidentally, again Albert prefers to define by making refers to Euclid). This said, it is difficult to avoid the impression that, throughout Albert's analysis, the notion of point acquires a logical and an ontological consistency that it certainly did not have (at least not to the same extent) in Aristotle and in the previous commentary tradition. This aspect will, indeed, always accompany the Medieval Latin debate on the continuity of magnitudes.

It is important to underline that this innovative understanding of the definition and of the "constitution" of continuous quantities does not have, however, major implications for what concerns Albert's analysis of the properties of the continuum, and, especially, for what concerns the relation between continuity and (potential) infinite divisibility. Moreover, both in his commentary on *Categories* 6 and on *Physics* VI.1, Albert fully endorses the so-called 'isomorphism thesis' and the fact that the continuity of time is founded upon that of motion, which, in its own right, is founded upon that of the magnitude over which motion takes place[258]. Finally, even in his commentary on *Physics*

[258] For what concerns Albert's *Physics* commentary, see, for instance, ALBERTUS MAGNUS, *Physica*, Liber VI, tract. I, cap. 2, ed. HOSSFELD, p. 449, ll. 22-29: "Cum *enim* super magnitudinem sit motus localis, *si* dicatur *magnitudo* aliqua *componi ex indivisibilibus*, oportebit dicere, quod *motus, qui est* super eam, *componatur etiam ex indivisibilibus motibus aequalibus* indivisibilibus illius magnitudinis, quia, sicut supra in quarto libro huius scientiae docuimus, motus sequitur magnitudinem et prius et posterius in motu sunt a priori et posteriori in spatio sive magnitudine"). This aspect also features prominently at the beginning of the analysis of 'quantity' in Albert's *De Praedicamentis*. Indeed, in cap. 1 of tract. III, Albert takes the occasion of Aristotle's list of the kinds of continuous quantities as lines, surfaces, bodies and, *beyond these* (*praeter haec*), time and place, to explain why time, place (and motion) are continuous only in a derivative way, while magnitudes are so in a primary way: "Alia enim suae continuitatis habent causam intra se et intra suam propriam continuitatem essentialiter contentam ut linea punctum, et superficies lineam, et corpus superficiem; locus autem in sua continuitate habet terminum corporis locati, qui non est locus, et tempus continuatur continuitate motus, motus autem continuatur continuitate mobilis et continuitate magnitudinis inter duos terminos motus existentis. Hac igitur de causa dicitur quod 'praeter haec' sunt 'tempus et locus'" (ALBERTUS MAGNUS, *De Praedicamentis*, tract. III, cap. 1, ed. SANTOS NOYA, STEEL, DONATI, p. 51, l. 52-

V.3, Albert provides a rather traditional understanding of continuity, thus making it clear that, as said, his conceptual innovations are taken to be fully compatible with a traditional Aristotelian framework. He does, however, adopt Averroes' distinction between mathematical (geometrical) and natural touching, thus showing that he is particularly aware of the methodological need to distinguish between the mathematical (geometrical) and the physical levels in the analysis of continuity. Yet, even in this context, Albert shows to be strongly influenced not only, and probably not mainly, by Averroes, but rather by the geometrical tradition stemming from Euclid's *Elements*:

> [The things which] touch each other physically [are], instead, those whose extremities are together in the way in which we have said [i.e., that are together in the same primary place][259]. They are not properly together, moreover, if not when they remain distinct. Given, indeed, that contact is [also] in mathematical magnitudes, then mathematical magnitudes are said to be touching each other when they are overlapped one on the other according to two extremities: hence mathematical bodies touch each other when their surfaces are overlapped one on the other, and surfaces touch each other when [their] points are overlapped one on the other. When, moreover, a line touches a line, then points, as has been said, in one

p. 52, l. 2). Importantly, in this passage (differently from the one from Albert's commentary on *Physics* VI.1 quoted above) the continuity of motion is founded both on that of the (geometrical) magnitude over which motion takes place and on that of the moving magnitude itself, a claim certainly less faithful to Aristotle's own doctrine.

[259] Albert's position concerning Aristotle's definition of 'being together in the same primary place' is extremely restrictive, although it is quite close to the majority view among previous commentators (including Simplicius and Averroes), which interprets this Aristotelian notion as applying (albeit somehow improperly) to two bodies whose surfaces are touching, so that 'being together in the same primary place' and 'touching' become the same extensionally, albeit they still differ intensionally (inasmuch as, in Albert's view, the notion of 'touching' concerns the surfaces, or in general the extremities, of the bodies considered, while the notion of 'being together in the same primary place' concerns the bodies whose extremities are touching). Albert, to be precise, suggests two possible solutions of what Aristotle meant with the notion of 'being together in the same primary place'. The Simplician-Averroistic view is only the second option he individuates, by referring to the fact that the notion of touching refers, intentionally, to the *internal* extremities of the two bodies considered (*ultima intra*), whereas the notion of 'being together in the same primary place' refers to the *external* extremities of the two bodies considered (*ultima extra*). A first option, instead, is that a body (considered as a whole, *totum*) can be said to be together in place with the totality of its parts (*universitas suarum partium*), albeit they differ both in their existence (*esse*) and in their definition (*ratio*): "Cum autem locus et locatum sunt aequalia, ut dictum est in quarto huius scientiae, et duo sunt maiora quam unum, videntur duo vel plura non posse esse in loco uno proprio, sed in duobus locis; nulla ergo videbuntur simul esse secundum naturam. Sed ad hoc dicimus, quod nulla corpora physica diversa sunt in uno loco proprio, sed quod est unum subiecto, aliquando habet diversitatem secundum esse et rationem; totum enim idem est subiecto cum universitate suarum partium et differt in esse et ratione, et totum et partes universae sunt simul in loco uno. Aut aliter forte dicendum, quod cum dicuntur aliqua simul esse secundum eundem proprium locum, intelligitur proprius locus non unius, sed duorum, et hoc est, quando contingunt se in loco utriusque proprio. Et hoc modo *simul* cadit in diffinitione eius quod est *tangere*, sicut inferius patebit. Et differt ab eo quod est tangere, in eo quod tactus perficitur in ultimis, *quae* sunt *ultima* corporis, intra, quae sunt aliquid corporum tangentium, simul autem perficitur in ultimis corporum extra, hoc est, quae non sunt aliquid corporum tangentium" (ALBERTUS MAGNUS, *Physica*, Liber V, tract. II, cap. 1, ed. HOSSFELD, p. 422, ll. 24-44).

> extremity of the lines are overlapped either in a rectilinear way or in an obliquus one. And then if they are applied [one on the other] in a rectilinear way, Euclid says – and it is proved in the first book of the *Elements of Geometry* –, that they form a single point. If, instead, [points] are overlapped in an obliquus way, then they form an angle which is created through the contact of two lines in a point by a non-rectilinear application. And similarly it happens in the application of surfaces, which produces a single line in which they are reciprocally applied. And similarly through the application of mathematical bodies a single surface is produced with two: and therefore touching with each other in a mathematical way, they do not have the extremities together, but united. However, [the bodies] which touch and are applied one on the other in a physical way, preserve their existence (*esse*) as distinct entities, and therefore they are not united, and their extremities do not make up a single whole, but they are together in the way which has been said[260].

The passage, when compared with the corresponding ones from Averroes quoted in the previous section, clearly shows the extent of Euclid's influence on Albert. Indeed, Albert deems more important to quote Euclid than Averroes in order to support his claim that geometrical entities, when they touch, immediately become continuous. Moreover, Albert inserts in this context a digression concerning the formation of angles by the conjunction of two lines, something which is completely absent from Averroes' commentaries on this passage. Yet, Averroes is without doubt Albert's source for the distinction between a mathematical (geometrical) and a physical touching. Moreover, Albert is also clearly influenced by Averroes in his constant effort to keep distinct, here and in all the passages concerned with the discussion of continuity, the mathematical (geometrical) from the physical level of analysis. If there is one element which characterises all the subsequent discussion of continuity in the Latin West, it is exactly the progressive divergence between these two levels, one which, in the 14th century, will give rise to purely

[260] ALBERTUS MAGNUS, *Physica*, Liber V, tract. II, cap. 1, ed. HOSSFELD, p. 423, ll. 1-29: "*Tangunt autem* se physice, *quorum* termini *sunt simul* modo, quo diximus. Non sunt autem proprie simul, nisi quae remanent diversa. Cum enim tactus sit in mathematicis magnitudinibus, tunc dicuntur se tangere mathematicae magnitudines, quando sibi secundum duos terminos superponuntur, unde corpora mathematica tunc se tangunt, quando superficies eorum superponuntur ad invicem, et superficies se tangunt, quando lineae earum superponuntur sibi, et lineae se tangunt, quando puncta ad se invicem superponuntur. Quando autem linea tangit lineam, tunc puncta, ut dictum est, in uno extremo linearum superponuntur directe sibi vel oblique, et tunc si directe applicantur, dicit Euclides et probatur in *Geometricis*, libro primo, quod efficiuntur linea una, et ideo punctua sibi superposita efficiuntur punctum unum. Si autem oblique sibi applicantur, tunc faciunt angulum, qui in contactu duarum linearum in puncto uno applicatione non directa factus est, et tunc iterum duo puncta efficiuntur unum; et similiter fit in applicatione superficierum, quod efficitur linea una, in qua sibi applicantur; et similiter in corporum mathematicorum applicatione efficitur una superficies cum duabus. Et ideo tangentia se mathematice non habent ultima simul, sed unum. Sed tangentia et applicata sibi physice retinent esse suum distinctum et ideo non uniuntur nec idem fiunt sua ultima, sed simul sunt modo, qui dictus est."

geometrical (and purely physical) attacks on the Aristotelian conception of the continuum, yet almost never entirely without some interplay between each other.

A final important aspect to mention in connection with Albert's understanding of the relation between continuity and (potential) infinite divisibility is the fact that, virtually contrary to all the previous commentary tradition, he suggests, while commenting on *Physics* VI.1, that (potential) infinite divisibility might represent a definition of continuity[261]. Probably, Albert is influenced by Aristotle's claim concerning the co-implication of continuity and infinite divisibility, and especially by those passages, mentioned above, in which Aristotle claims that everything which is infinitely divisible is continuous, and not only, as in *Physics* VI.1 (and 2), that everything continuous is infinitely divisible[262].

All in all, therefore, Albert seems to explicitly admit three different definitions of continuity. To the traditional one of those things whose extremities, and those of their parts, are one (which he still fully endorses[263]), he also adds the definition of continuity as (potential) infinite divisibility, and therefore of continuous things as those which are divisible into parts which are always further divisible, and he also adds a third, original definition, according to which continuity is the result of the imagined motion of a *continuans* over a *continuatum*. Albert's position is therefore highly innovative when compared with the previous commentary tradition analysed in this chapter. It might be tempting to say that Albert is thus working with three intensionally different, but extensionally equivalent, definitions of continuity, which he sees as fully compatible ones. Nevertheless, whether or not this is true, what is certain is that Albert sees the three definitions as compatible and, more precisely, as capturing different *essential* aspects of continuity.

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[261] Cf. ALBERTUS MAGNUS, *Physica*, Liber VI, tract. I, cap. 1, ed. HOSSFELD, p. 449, ll. 3-4: "[...] quia diffinitio continui est, quod dividitur in semper divisibilia."

[262] Cf. ALBERTUS MAGNUS, *De caelo et mundo*, Liber I, tract. I, cap. 2, in ID., *De caelo et mundo (Alberti Magni Opera Omnia Tomus V, Pars 1)*, ed. P. HOSSFELD, Münster i.W., Aschendorff Verlag, 1971, p. 6, ll. 50-52: "Amplius autem, *omnis magnitudo* habens in se formam *separationis* habet etiam in se formam continuitatis, quia *omne divisibile* est *continuum proculdubio*."

[263] Cf. ALBERTUS MAGNUS, *Physica*, Liber V, tract. II, cap. 3, ed. HOSSFELD, p. 425, ll. 37-43: "*Continua* autem sunt, quorum ultima sunt unum, hoc est, cum *utriusque* continuorum sit *unus et idem terminus, et* ita *continuantur* ad invicem, *sicut significat nomen*. Continuum enim dicitur quasi simul in uno se tenens vel in uno se *tangens*. Numquam *autem hoc esse potest,* si *termini,* qui *sunt ultima, sint duo* vel plura, quia tunc tangentia sunt solum et non continua."

Albert's claim that (potential) infinite divisibility represents a definition of continuity migh also be linked to the third original element that characterises Albert's doctrine of the continuity of magnitudes and of their (potential) infinite divisibility. This is his idyosinchratic interest in Democritean atomism. From several of the passages quoted above, taken from Albert's commentary on *Physics* VI.1, it has already become clear that Albert adheres to the Aristotelian criticism against atomism (identified with the position held by Leucippus and Democritus), insofar as this doctrine supports the idea that magnitudes (and, of course, also motion and time) are composed of indivisible entities as their *quantitative* parts.

Still, in his commentary on *De generatione* I.2, Albert devotes a considerable effort to the attempt not only to explain Aristotle's "atomistic dilemma" and his reply to it, but rather also in trying to understand the atomists' own positions (as well as those that Aristotle attributes to Plato concerning the generation of physical entities from mathematical surfaces). It is in this context (esp. *Liber de generatione*, Book I, tr. I, cap. 12) that Albert inserts an extremely interesting section where he tries to assimilate Democritus' atoms to Aristotelian *minima naturalia*. The passage, which probably inspired 14th-century doctrines of physical atomism, such as that of Nicholas of Autrecourt[264], is, however, best understood in the context of the overall debate on *minima naturalia*, and it will therefore be discussed in detail in the next chapter. Still, one thing about this passage must be mentioned in the present chapter. Albert, indeed, accepts Leucippus' and Democritus' atomism insofar as it is a doctrine which affirms that (homogeneous) physical bodies are composed of minimal parts, i.e., *minima naturalia*, which are the smallest possible bodies which still can exist in act preserving their substantial form (which Albert interprets as the limit below which a substantial form cannot perform its proper operation, i.e., a *minimum secundum operationem*[265]). At the same time, Albert rejects atomism insofar as it affirms that bodies, be they mathematical or physical, are composed of indivisibles: even the *minima* of physical bodies remain, insofar as they are magnitudes, continuous and therefore (potentially) infinitely

[264] On this aspect, see especially C. GRELLARD, *Nicholas of Autrecourt's Atomistic Physics*, in C. GRELLARD, A. ROBERT (eds.). *Atomism in Late Medieval Philosophy and Theology (Medieval and Early Modern Philosophy and Science 9)*, Leiden, Brill, 2009, pp. 107-126.
[265] On this notion, see *infra*, Chapter 2.

divisible[266]. Albert brings here to its natural completion the careful distinction between the mathematical (geometrical) level of analysis of continuity, which affects physical bodies only accidentally, that is, insofar as continuity is one of their accidental properties (*in eo quod corpus*, to quote Albert's expression), and the physical one, which introduces in the discussion the limits to continuity and (potential) infinite divisibility which can be found in physical bodies insofar as they are enmattered hylomorphic compounds (*in eo quod physicum*, to quote, again, Albert's expression). Therefore, according to Albert, it is not true, not even in potency, that a physical body can be infinitely divided while remaining the same kind of hylomorphic substance (although its matter is potentially infinitely divisible):

> Since, indeed, we have said that a body is infinitely divisible, this is not true of natural bodies. In them, indeed, it is reached a *minimum* and it is that [i.e., the *minimum*] which can accomplish the operation of the natural body, because if that is divided, it is corrupted by operation and by essence, because it cannot resist to the altering agents [i.e., the primary qualities of the surrounding medium]. If, therefore, it is conceded that a body is infinitely divided, and it is composed of infinite [elements], it will not be appropriate [to say] that this be true of a natural body (Book I, tr. I, cap. 14)[267].

After having determined the "physical" limits to (potential) infinite divisibility, Albert starts addressing the fundamental issue of how the notion of a potency which can never be actualised is to be understood in this context. Thus Albert, just after the passage quoted above, glossing Aristotle's final solution to the "atomistic dilemma", provides an

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[266] ALBERTUS MAGNUS, *De generatione et corruptione*, Liber I, tract. I, cap. 12, ed. HOSSFELD, p. 120, ll. 44-55: "Democritus autem videbat, quod omnia naturalia heterogenia componuntur ex similibus sicut manus ex carne et osse et huiusmodi, similia vero componuntur secundum essentiam ex minimis, quae actionem formae habere possunt; licet enim non sit accipere minimum in partibus corporis, secundum quod est corpus, quod non possit accipi minus per divisionem, tamen est in corpore physico accipere ita parvam carnem, qua si minor accipiatur, operationem carnis non perficiet, et hoc est minimum corpus, non *in eo quod corpus*, sed *in eo quod physicum*, et hoc vocavit atomum Democritus" (emphasis mine). The fact that physical bodies are always understood by Albert to be continuous, even in this context, is also proved by the passage from *De caelo et mundo*, Liber I, tract. I, cap. 2 mentioned above, according to which it is exactly in the *De generatione*, Liber I, and in the *Metaphysics* that Albert purports to prove that there are no indivisible bodies.

[267] ALBERTUS MAGNUS, *De generatione et corruptione*, Liber I, tract. I, cap. 14, ed. HOSSFELD, p. 123, ll. 36-46: "Cum enim corpus dicitur esse divisibile in infinitum, non est hoc verum de naturali corpore. Minimum enim in illo accipitur et est id quod operationem corporis naturalis perficere potest, quia si dividatur, corrumpitur ab operatione et essentia, quia alterantibus resistere non potest. Si ergo concedatur corpus dividi in infinitum et ex infinitis componi, non erit conveniens, quod hoc verum sit de naturali corpore."

interpretation which is probably the most explicit one (compared with previous commentators) of why the division of a continuous entity can never be fully actualised, neither through a simultaneous nor through a successive process of division, an interpretation which, moreover, is fundamentally the same that has been provided in the second section of this chapter:

> Moreover, though, when it is said of mathematical quantity [i.e., of a continuum insofar as it is a continuum] that it is [potentially] infinitely divisible, this is intended in potency, not in act. It [i.e., a mathematical quantity] is indeed divided in act between two points in a middle point, in such a way that the 'middle' is not taken according to the fact that it is at the same distance from both extremities, but according to a great distance of the middle, insofar as a 'middle' is what is between the extremities; this indeed is a middle in quantity according to potency, and it is actualised when division happens in it. [Regarding], however, what says Plato[268], i.e., that the same is true of a point and of the one which is "immediately next" to it, it must be said that no point is "immediately next" [to another], because not a point, but a continuum is immediately joined to it. If, however, someone says that, before the division, the same holds of all the intermediate points [between the extreme points of the line considered], and so [the quantity] can be divided in any of them together, it must be said that it is true that the same holds for all [the intermediate points] in respect to the fact that the division can be performed in any [of them]. If, however, it is divided in one [point], then the division cannot be performed in the one "immediately next" [to it], because in this way a point would not be continued by a point and between points there would not be a continuum, all things which have been shown to be impossible in *Physics* VI [cf. *Physics* VI.1, and Albert's *Physica*, Book VI, tr. 1, cap. 1] (*Liber de generatione*, Book I, tr. I, cap. 14)[269].

A point is always the limit of a line: therefore, although on a given line it is possible to perform a division at any of its points, division at one point makes it impossible (either simultaneously or successively) to divide the same line at a point "immediately next" to

[268] Curiously, Albert interprets the "atomistic dilemma" not as being an argument between (Leucippus and) Democritus and Aristotle himself, but rather between (Leucippus and) Democritus and Plato. Probably, this is because, in *De generatione* I.2, the positions of the atomists and of Plato are frequently mentioned together.

[269] ALBERTUS MAGNUS, *De generatione et corruptione*, Liber I, tract. I, cap. 14, ed. HOSSFELD, p. 123, ll. 46-66: "Amplius, cum de quantitate mathematica dicitur, quod est divisibilis in infinitum, intelligitur hoc potentia, non actu. Est enim ipsa divisa actu inter duo media in puncto uno medio, ita quod unum non accipiatur per aequidistantiam, sed secundum largam distantiam medii, secundum quod medium est, quod est inter extrema; hoc enim medium est in quanto potentia et fit actu, quando in ipso fit divisio. Quod autem dicit Plato, quod eadem ratio fuit in illo puncto et de proximo sibi coniuncto, dicendum, quod nullum est proximum, quia non punctum, sed continuum coniunctum est illi. Si autem dicat aliquis, quod antequam dividatur, una est ratio de omnibus punctis intermediis et sic in quolibet dividi potest simul, dicendum, quod verum est, quod una est ratio de omnibus quoad hoc quod in quolibet potest fieri haec divisio. Sed tamen si dividatur in uno, tunc non potest fieri divisio in proximo, quia sic punctus non continuaretur puncto et inter punctum et punctum non esset continuum, quae omnia impossibilia esse ostensa sunt in sexto *Physicorum*."

the one which has already been actualised by division. To clarify this concept, Albert glosses the notion of 'being potentially infinitely divisible' used by Aristotle in this context in (modal) logical terms, an innovation which not only does not find any clear precedent in the Late Ancient commentary tradition, or even in Averroes, but one, moreover, that was to find an important posterity in subsequent Medieval Latin commentaries on this passage, as the rest of the chapter will show. According to Albert, potential infinite divisibility is best understood, for every couple of points "immediately next" to each other, as the conjunction of two incompossible propositions:

> Hence many things are possible, which, however, are not compossible; possible indeed is [the fact] that any of two contrary contingent [events] can happen, although they cannot exist as true [i.e., as happening or happened] together; therefore indeed it is possible to divide a continuum at any point, not, however, together, rather successively (*successive*)[270], because otherwise an infinitiy according to number would be in actuality, what has been shown to be false in *Physics* III. […] Because if the adverb 'everywhere' defines the word 'possible', it is true, because then the sense [of the proposition 'being everywhere potentially divisible'] is: anywhere, i.e., in any point, it is possible to divide the magnitude; if however [the adverb 'everywhere'] defines the word of 'division', it is false, and the sense is: it is possible that magnitude is divided everywhere, i.e., in every point; this indeed is false, as has appeared above[271].

What Albert provides is therefore a logical interpretation of the Aristotelian proposition 'being everywhere potentially divisible' as shorthand for an (infinite) series of (couples of) incompossible propositions. This is certainly one of the most elaborate interpretations

[270] It is clear from the context that here *successive* is not to be interpreted in a temporal way, rather in what might be called a "modal" way: in a certain possible world, a line AB is divided at point C, and this makes it impossible to divide it also at point D, "immediately next" to point C, either simultaneously or at a successive stage of division. In another possible world, however, the same line AB can be divided at point D, and this makes it impossible to divide it also at point C, either simultaneously or at a successive stage of division.

[271] ALBERTUS MAGNUS, *De generatione et corruptione*, Liber I, tract. I, cap. 14, ed. HOSSFELD, p. 123, ll. 66-73; p. 123, l. 77-p. 124, l. 3: "Unde multa sunt possibilia, quae non sunt compossibilia; possibile enim est, quod utrumque contrariorum contingentium verificetur, non tamen simul vera existunt; ergo enim est possibile in quolibet puncto continuum dividi, non tamen simul, sed successive, quia aliter infinita multitudine erunt actu, quod in tertio *Physicorum* est improbatum. [...] Quia si adverbium 'ubique' definiret verbum possibile, vera est, quia tunc sensus est: ubique, idest in quolibet puncto, possibile est magnitudinem dividi; si autem definiret verbum divisionis, falsa est, et est sensus: possibile est, ut magnitudo ubique, idest in quolibet puncto, dividatur; hoc enim est falsum, ut prius patuit." The difficulty of this passage lies in the fact that Albert uses *ubique*, and, correlatively, the expression *in quolibet puncto* to express the two different senses which I have tried to distinguish in translating *ubique* by using 'anywhere' in the first case and 'everywhere' in the second one. Although this is not a literal translation, I believe that it is justified by the context of the passage.

of the passage in the commentary tradition up to Albert (although it represents only an intuition which is not articulated in detail, something that later Medieval Latin commentators will try to do in different ways). Moreover, however, it is also an extremely important one in the fact that it definitely shifts the focus from the *temporal* to the "*modal*" plan of the discussion of (potential) infinite divisibility. The later Latin masters discussed in the chapter (with the exception of Aquinas), when dealing with the notion of (potential) infinite divisibility, will not be able anymore to avoid providing an analysis of the impossibility to actualise an infinite division of a continuous entity using the tools of modal logic.

1.5.2. Thomas Aquinas

When compared with Albert's perspective, that of Thomas Aquinas (ca. 1225-1274) is much closer to the Aristotelian texts, although it is to be remarked that in Aquinas some of the innovative aspects presented by Albert find an important place[272]. As a result, differently from what done in the case of Albert, it seems more useful to present Aquinas' views on the continuity of magnitudes and on their (potential) infinite divisibility by systematically looking at his relevant Aristotelian commentaries. In what follows, I will

[272] Aquinas, however, explicitly rejects Albert's 'doctrine of the flux' concerning the constitution of geometrical entities, and therefore all its implications for the analysis of the notion of continuity. Cf. THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, Liber IV, Lectio 18, n. 591, ed. MAGGIOLO, p. 288: "[…] punctum continuat lineam et distinguit ipsam in quantum est principium unius partis et finis alterius. Sed tamen differenter se habet in linea et puncto, et tempore et *nunc*. Quia punctum est quoddam stans, et linea similiter […]." For an analysis of Aquinas' conception of time and of the instant, see A. GHISALBERTI, "La nozione di tempo in S. Tommaso", *Rivista di Filosofia Neo-Scolastica* 59 (3), 1967, pp. 343-371.

mostly focus on his commentary on the *Physics*[273], on the *De generatione*[274] and on the *Metaphysics*[275], since Aquinas did not compose a commentary on the *Categories*.

Aquinas' considerations on *Metaphysics* Δ.6 are not a full-fledged commentary of the text. Indeed, Aquinas is more worried, in his Lectio 11 of Book V, corresponding to this chapter, to provide a systematic framework to discuss the properties of unity (*unum*), diversity (*diversum*) and difference (*differentia*) as applying to all substances[276]. In the context of the discussion of the kinds of *per se* unity[277], Aquinas reorganises the Aristotelian exposition, and he distinguishes them in two broad categories. A first category includes the kinds of *per se* unity which apply specifically to the matter of a substance, i.e., unity by species and by number, while a second category includes the kinds of *per se* unity which apply to a substance as whole: here Aquinas includes unity by continuity, and unity and indivisibility in reason[278]. It is interesting to notice that

[273] THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO.

[274] THOMAS DE AQUINO, *In Aristotelis libros De caelo et mundo, De generatione et corruptione, Meteorologicorum expositio*, ed. R.M. SPIAZZI, Torino, Marietti, 1952. The commentary, probably Aquinas' last philosophical work, is incomplete, and it has been brought to completion by an anonymous author. Aquinas' own exposition ends with the lectio 17 on Book I of the *De generatione*, dealing with chapter 5 of the Aristotelian treatise, concerning the issues of augmentation and diminution. Aquinas also wrote a separate treatise concerning the issue of mixture (discussed by Aristotle in *De generatione* I.10), the *De mixtione elementorum*, which has been edited in the last decades in the so-called *Editio Leonina* of Aquinas' works as THOMAS DE AQUINO, *De principiis naturae, De aeternitate mundi, De motu cordis, De mixtione elementorum, De operationibus occultis naturae, De iudiciis astrorum, De sortibus, De unitate intellectus, De ente et essentia (Opera Omnia iussu Leonis XIII P.M. edita, Tomus XLIII)*, Editori di San Tommaso, Roma, Commissio Leonina, 1976. However, since, as in the case of Alexander, this treatise is not directly related to the passages of the *De generatione* discussed in the present chapter (and in the thesis more generally), it will be left out of consideration.

[275] THOMAS DE AQUINO, *In duodecim libros Metaphysicorum Aristotelis expositio*, ed. M.R. CATHALA, R.M. SPIAZZI, Torino-Roma, Marietti, 1964.

[276] Cf. THOMAS DE AQUINO, *In duodecim libros Metaphysicorum Aristotelis expositio*, Liber V, lectio 11, n. 907, ed. CATHALA, SPIAZZI, p. 244.

[277] Cf. THOMAS DE AQUINO, *In duodecim libros Metaphysicorum Aristotelis expositio*, Liber V, lectio 11, n. 911, ed. CATHALA, SPIAZZI, p. 245.

[278] THOMAS DE AQUINO, *In duodecim libros Metaphysicorum Aristotelis expositio*, Liber V, lectio 11, n. 911, ed. CATHALA, SPIAZZI, p. 245: "Omnes enim modi, quibus aliqua unum per se dicuntur, reducuntur ad *duos*: quorum *unus* est secundum quod dicuntur unum illa, quorum materia est una; sive accipiamus materiam eamdem secundum speciem, sive secundum numerum; ad quod pertinet secundus et tertius modus unius. *Alio modo* dicuntur unum, quorum substantia est una: vel ratione continuitatis, quod pertinet ad primum modum: vel propter unitatem et indivisibilitatem rationis, quod pertinet ad quartum et quintum. Unde et his modis dicuntur aliqua esse idem." The references to the order of the *modi* of *per se* unity provide, of course, the correspondences with the Aristotelian text. Furthermore, at the end of the passage Aquinas inserts a fundamental remark concerning the fact that 'unity' is taken by him, in this context, as a synonym of 'identity'. While there is no space to discuss this aspect further here, the basic account provided by Aquinas consists in remarking that the notion of identity entails some kind of unity, either in reality (*secundum esse*) or in the intellect: "Ex hoc autem ulterius concludit, quod identitas est unitas vel unio; aut ex eo quod illa quae dicuntur idem, sunt plura secundum esse, et tamen dicuntur idem in quantum in aliquo uno conveniunt. Aut quia sunt unum secundum esse, sed intellectus utitur eo ut pluribus ad hoc quod relationem intelligat. Nam non potest intelligi relatio nisi inter duo extrema. Sicut cum dicitur aliquid esse

Aquinas considers 'unity by continuity', which, in the Aristotelian text, is presented as the first kind of *per se* unity and, arguably, one applying specifically to the matter of a substance, as, instead, belonging to a substance as a whole. While this thought is not further articulated by Aquinas, it certainly suggests that in his conception continuity, although it remains a quantitative (therefore accidental) property of a substance, reaches deep into its overall ontological structure.

In his commentary on *Metaphysics* Δ.13 (Book V, Lectio 15), Aquinas is, again, more concerned with the structure of the Aristotelian exposition than with a thorough discussion of the role that the notion of continuity plays in the chapter. Yet, as seen, even in the Aristotelian text of this chapter the notion of continuity is taken as a premiss, and, therefore, it is not surprising that Aquinas does not consider it necessary to expound it while commenting on the text of the chapter[279].

For what concerns Aquinas' commentary on *Physics* V.3 (Book V, Lectio 5), it must be noticed that the text is particularly close to the Aristotelian exposition[280]. In regard of the points that have been at the centre of the analysis in commentaries on this chapter, Aquinas does not present a full interpretation of Aristotle's definition of 'being together in the same primary place'. He mainly limits himself to remark that the 'primary

idem sibiipsi. Tunc enim intellectus utitur eo quod est unum secundum rem, ut duobus" (*ibid*., n. 912, p. 245). In this sense, continuity in Aquinas' view is not only the first kind of *per se* unity in a substance, as a substance, but also the first kind of (*per se*) identity in a substance, as a substance.

[279] Aquinas' only remarks concerning continuity more directly are a true paraphrasis of the Aristotelian text: "Multitudo est, quod est divisibile secundum potentiam in partes non continuas. Magnitudo autem quod est divisibile in partes continuas. Quod quidem contingit triplicitier: et secundum hoc sunt tres species magnitudinis. Nam, si sit divisibile secundum unam tantum dimensionem in partes continuas, erit longitudo. Si autem in duas, latitudo. Si autem in tres, profunditas. Ulterius autem, quando pluralitas vel multitudo est finita, dicitur numerus. Longitudo autem finita, dicitur linea. Latitudo finita, <dicitur superficies, profunditas finita,> corpus. Si enim esset multitudo infinita, non esset numerus; quia quod infinitum est, numerari non potest. Similiter, si esset longitudo infinita, non esset linea. Linea enim est longitudo mensurabilis. Et propter hoc in ratione lineae ponitur, quod eius extremitates sunt duo puncta. Simile est de superficie et corpore" (THOMAS DE AQUINO, *In duodecim libros Metaphysicorum Aristotelis expositio*, Liber V, lectio 15, n. 978, ed. CATHALA, SPIAZZI, pp. 260-261). It is noteworthy, nonetheless, that Aquinas explicitly claims (in a way somewhat reminiscent of Albert) that points, as extremities, feature in the definition (*ratio*) of a line.

[280] Which, however, he is always careful to present in a systematic way: concerning, in particular, the seven definitions given by Aristotle in *Physics* V.3, he usefully gathers them in three groups: "primo definit (sc. Aristoteles) ea quae pertinent ad *tangere*; secundo ea quae pertinent ad hoc quod est *consequenter*, ibi: *Medium vero* etc.; tertio ea quae pertinent ad *continuum*, ibi: *Continuum autem* etc." (THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, Liber V, lectio 5, n. 685, ed. MAGGIOLO, p. 340). The first group contains the definitions of 'touching' and, insofar as it presupposes them, those of 'being together in the same primary place' and of 'being separate'. The second group includes those of 'being intermediate', 'being successive' and 'being contiguous', while the last one includes merely the definition of 'being continuous'.

place' of a body is its 'proper place'[281], thus setting himself apart from almost all the previous commentary tradition, including (in a prominent position) Albert the Great, since a common trait of such tradition had always been that of trying to make sense of a definition which, apparently, was incompatible with the way in which the notion of 'primary place' of a body had been defined by Aristotle in *Physics* IV.1-5. Still, Aquinas has something to add to the notion of primary place while discussing the definition of 'touching'. Here Aquinas remarks the following:

> 'Touching' moreover are said those [bodies] whose extremities are together. The extremities, however, of bodies are surfaces, and the extremities of surfaces are lines, and the extremities of lines are points. If, therefore, it is assumed that two lines touch in their extremities, two points of the two lines which touch each other will be contained by a single point of the containing place. And due to this it does not follow that what is in the place (*locatum*) is greater than the place (*loco*): because a point added to a point does not produce anything greater [than the first point]. And this is true also of the other [kinds of extremities][282].

Aquinas' interpretation of the notion of touching seems to be based on a double assumption. On the one hand, he interprets in a very literal way Aristotle's definition, in that he takes the notion of 'extremities', or 'limits', used here as referring only to mathematical entities, according to the definition of 'mathematical entities' given by Aristotle, for instance, in *Physics* II. In this sense, Aquinas seems to be interpreting Averroes' and Albert's distinction between a mathematical (geometrical) and a physical notion of touching by reducing the latter to the former and by claiming, therefore, that the

[281] Indeed, Aquinas limits himself to claim that "[...] illa dicuntur esse *simul secundum locum*, quae sunt in uno loco primo; et dicitur primus locus uniuscuiusque, qui est proprius locus eius" (THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, Liber V, lectio 5, n. 685, ed. MAGGIOLO, p. 340). It is true, however, that Aquinas clarifies two possible misunderstandings which could follow from this definition, namely, the confusion between two things being in the same primary place and two things being in a common place, and the confusion between 'together' (*simul*) as referring to place and to time: "Ex hoc enim aliqua dicuntur esse simul, quod sunt in uno loco proprio: non autem ex hoc quod sunt in uno loco communi; quia secundum hoc posset dici quod omnia corpora essent simul, quia omnia continentur sub caelo. Dicit (sc. Aristoteles) autem quod *simul* dicuntur haec esse secundum locum, ad differentiam eorum quae dicuntur esse *simul* tempore: hoc enim non est nunc ad propositum" (*ibidem*).

[282] THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, Liber V, lectio 5, n. 685, ed. MAGGIOLO, p. 340: "*Tangere* autem se dicuntur, quorum sunt ultima simul. Ultima autem corporum sunt superficies, et ultima superficierum sunt lineae, et ultima linearum sunt puncta. Si ergo ponatur quod duae lineae se tangant in suis ultimis, duo puncta duarum linearum se tangentium continebuntur sub uno puncto loci continentis. Nec propter hoc sequitur quod locatum sit maius loco: quia punctum additum puncto nihil maius efficit. Et eadem ratione se habet in aliis."

notion of touching applies in its own right only to geometrical entities[283]. On the other hand, Aquinas seems to claim, quite explicitly, that even in the case of the mathematical (geometrical) notion of touching, it is not the case that two extremities touching thereby become one, so making the entities to which they belong continuous with each other, as Averroes and Albert had claimed. Rather, Aquinas seems to believe that the (geometrical) extremities of two entities, such as points in a line, can be co-located (he explicitly talks of their being contained in the same primary place[284]) and fully coincident (since he acknowledges that the addition of the second to the first does not make it greater) while, at the same time, not becoming one. This notion of distinct co-located (geometrical) extremities is an innovative element in commentaries on *Physics* V.3. However, how should it be properly interpreted? Aquinas does not provide a direct answer, yet the right direction seems to be to claim that the two extremities remain functionally distinct while numerically becoming one: they are still distinguishable insofar as they are the extremities of different entities. By, instead, losing this function and thereby becoming part of the same entity, they become one and the entities to which they belong become a continuous whole.

This last aspect is stressed in Aquinas' specific discussion of the definition of 'continuity' in his commentary on *Physics* V.3. Aquinas notes, indeed, that:

> When, indeed, the limits of two things which touch each other become one and the same, [this] is said to be a continuum. And this also means the name. Indeed, 'continuum' derives from 'containing' (*continendo*): when, therefore, many parts are contained in one, and they almost hold themselves together, then [this] is a 'continuum'[285].

[283] This does not mean, at the same time, that physical bodies cannot touch each other. Simply, what properly touches in them are their surfaces, which are mathematical entities, and in this sense there is no way, according to Aquinas, to distinguish a properly physical from a properly mathematical notion of touching. See also the following footnote and THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, Liber VI, lectio 2, n. 758, ed. MAGGIOLO, p. 377, where Aquinas explicitly claims that "proprie invenitur contactus" only "in linea et aliis continuis quantitatibus positionem habentibus" (i.e., in geometrical entities).

[284] If one links this remark with the previous definition of 'being together in the same primary place' given by Aquinas, it seems reasonable to claim that, in Aquinas' perspective, only two mathematical entities can be meaningfully said to be in the same primary place, and, if anything, by an (improper) extension, also the bodies of which they are the extremities. Of course, physical bodies touch each other, but what is properly touching, Aquinas wants to stress, are only their coinciding surfaces, which are, strictly speaking, mathematical (geometrical) entities.

[285] THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, Liber V, lectio 5, n. 691, ed. MAGGIOLO, p. 341: "Cum enim unus et idem fiat terminus duorum quae se tangunt, dicitur esse continuum. Et hoc etiam significat nomen. Nam continuum a *continendo* dicitur: quando igitur multae partes continentur in uno, et quasi simul se tenent, tunc est *continuum*."

Here, the etymological connection between *continuum* and *continere*, which mirrors the one even more evident in Greek (and discussed above), makes it plain that the two extremities which touch must become part of a single entity, if that is to be called continuous. What is more, Aquinas underlines, they do not only need to become 'one' (extremities, insofar as they are geometrical entities, indeed, become 'one' already by touching, as remarked above): they must also become the same (*idem*), in the sense, I believe, of not being able to be distinguished, even if only by their function as extremities of different entities[286].

Turning now to Aquinas' commentary on *Physics* VI.1 (and 2), again, the first element of importance must certainly be found in his ordering of the Aristotelian arguments, which, as said above, tend to appear somehow chaotic at first sight[287]. Aquinas' main subdivision of the chapter is, evidently, between a first part (cf. 231a18-b18) devoted most prominently to the discussion at the mathematical (geometrical) level (and also in physical magnitudes[288]) aimed at demonstrating that no continuum can be composed of indivisibles and divided into them, and a second part (cf. 231a18-232a23) where the same discussion is extended from magnitudes to motion and time[289]. In the first

[286] Here, therefore, it is possible to find an echo of Aquinas' idea, mentioned above in connection with his commentary on *Metaphysics* Δ.6, that continuity is not only (the first) kind of *per se* unity of a substance, but also the same kind of *per se* identity of a substance.

[287] Aquinas, in this aspect, certainly shares a worry which was common also to Averroes. Still, the strategy implied by the latter to bring order to *Physics* VI.1 (i.e., that of reconstructing all of Aristotle's arguments as categorical or hypothetical syllogisms) is significantly different from the one chosen by Aquinas, who, instead, coherently with his overall method of exposition of Aristotle's texts, is more worried to break up the text in smaller argumentative units (*divisio textus*) and to give those a proper hierarchical order.

[288] Albeit, according to Aquinas, in a less evident way: "[...] rationes supra positae [cf. 231a18-b18] manifestiores sunt in linea et aliis continuis quantitatibus positionem habentibus, in quibus proprie invenitur contactus" (THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, Liber VI, lectio 2, n. 758, ed. MAGGIOLO, p. 377; a passage partially quoted above).

[289] Aquinas, in this respect, fully endorses the 'isomorphism thesis': "Dicit ergo primo (sc. Aristoteles) quod eiusdem rationis est quod magnitudo et tempus et motus componantur ex indivisibilibus et dividantur in indivisibilia, vel nihil horum: quia quidquid dabitur de uno, ex necessitate sequetur de alio" (THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, Liber VI, lectio 2, n. 758, ed. MAGGIOLO, p. 377). Moreover, contrary to Albert's partial tendency to the contrary in his commentary on *Categories* 6, Aquinas, correctly interpreting Aristotle's own position in this respect, never puts into doubt that the continuity of motion (and the ensuing one of time) is founded upon the continuity of the (geometrical) magnitude over which motion occurs, and not that of the mobile thing itself: "si magnitudo ex indivisibilibus componitur, et motus qui transit per magnitudinem, componetur ex indivisibilibus motibus, aequalibus numero indivisibilibus ex quibus componitur magnitudo" (*ibid*., n. 759). See also his commentary on *Metaphysics* Δ.13, where this aspect is clarified beyond doubt: "Tempus enim est divisibile et continuum propter motum; motus autem propter magnitudinem; non quidem propter magnitudinem eius

part of the chapter, Aristotle, according to Aquinas, first presents two arguments to claim that a continuum cannot be composed of indivisibles (cf. 231a22-b7) neither *per modum continuationis*, nor *per modum contactus*, and he further presents a separate argument to claim that a continuum cannot even be composed of indivisibles *per modum consequenter se habentium* (cf. 231b7-10). It is only after this discussion that Aristotle separately presents a new argument to claim that a continuum cannot be divided into indivisibles. This is probably the most important passage of Aquinas' commentary on *Physics* VI.1-2, for the purposes of the present thesis:

> He [i.e., Aristotle] introduces the second main argument when he says "Again, they could be divided" etc. [cf. 231b10 ff.], which he takes from another definition of continuity, which he introduced before at the beginning of the third [Book of the *Physics*: cf. *Physics* III.1, 200b16-20], namely, that a continuum is that which is infinitely divisible: and the reason is this. Of whatever it is composed either a line or time, it is divided in those things: if, therefore, each of these were composed of indivisibles, it follows that it would be divided in indivisibles. But this is false, since no continuum is divisible into things which cannot be separated: in this way indeed it would not be infinitely divisible. Thus, no continuum is composed of indivisibles[290].

Aquinas talks explicitly, in this passage, of infinite divisibility as an *alia definitio* of continuity, that is, one different from the standard one of *Physics* V.3, according to which continuous things are those whose extremities are one. Now, I have already suggested above that Albert considered infinite divisibility as a *definitio* of continuity, one, moreover, not incompatible with the "standard" one of *Physics* V.3 (and also with the further original one provided by Albert himself based on the distinction between a *continuatum* and a *continuans*). In that context, I have shown, in support of this view, his remarks on this not only in commenting on *Physics* VI.1-2, but also in commenting on *De caelo* I.1, 268a28-29, i.e., one of the two passages where Aristotle explicitly affirms that whatever (in this case referring only to magnitudes) is infinitely divisible, that is also

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quod movetur, sed propter magnitudinem eius in quo aliquid movetur" (THOMAS DE AQUINO, *In duodecim libros Metaphysicorum Aristotelis expositio*, Liber V, Lectio 15, n. 985, ed. CATHALA, SPIAZZI, p. 261).

[290] THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, Liber VI, lectio 1, n. 755, ed. MAGGIOLO, p. 374: "Secundam rationem principalem ponit ibi: *Amplius dividerentur* etc., quae sumitur ex alia definitione continui, quam supra posuit in principio tertii, scilicet quod continuum sit quod est in infinitum divisibile: et est ratio talis. Ex quibuscumque componitur vel linea vel tempus, in ipsa dividitur: si igitur utrumque istorum componitur ex indivisibilibus, sequitur quod in indivisibilia dividatur. Sed hoc est falsum, cum nullum continuorum sit divisibile in impartibilia: sic enim non esset divisibile in infinitum. Nullum igitur continuum componitur ex indivisibilibus."

continuous, that is, that infinite divisibility entails continuity (such as continuity entails infinite divisibility, as affirmed by Aristotle in *Physics* VI.1-2).

Aquinas, instead, makes reference to the other passage where Aristotle acknowledges that infinite divisibility entails continuity, that is, *Physics* III.1, 200b16-20 (a passage, this time, referring primarily to motion). Thanks to this reference, Aquinas explicitly affirms that this is the *alia definitio* of continuity. The terminology used by Aquinas is already remarkable, inasmuch as it explicitly suggests what I have suggested as the correct interpretation in the case of Albert, namely, that even if Aquinas takes (potential) infinite divisibility to be *a* definition of continuity, he does not take it to be *the only* definition of continuity. In his view, evidently, the definition given by Aristotle in *Physics* V.3 and the definition in terms of (potential) infinite divisibility (to which Aquinas, differently from Albert, does not add a third definition) are extensionally equivalent but intensionally different. What is also remarkable in this passage is that the corresponding Aristotelian passage of *Physics* III.1 (as well as the one from *De caelo* I.1 appealed to by Albert) does not claim that (potential) infinite divisibility is the definition of continuity, rather, only that it entails continuity. That claim, however, complemented by the one in *Physics* VI.1-2 according to which continuity entails infinite divisibility, provides the basis for *constructing* infinite divisibility as a legitimate definition of continuity[291].

Turning now to Aquinas' commentary on *De generatione* I.2, the most interesting aspect of Aquinas' exposition is certainly represented by his remarks concerning the solution to the "atomistic dilemma". First, however, it must be mentioned that Aquinas explicitly acknowledges that the process of division to which Aristotle refers throughout the presentation and discussion of the dilemma can be both simultaneous and successive[292]. For what concerns the solution of the dilemma, Aquinas chooses to

[291] Aquinas upholds infinite divisibility as a definition of continuity even in commenting on *Physics* VI.2, 232b24-26 (cf. THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, Liber VI, lectio 3, n. 776, ed. MAGGIOLO, p. 384: "[...] quod si tempus est continuum, idest divisibile in semper divisibilia […]"). Still, it is to be noted that even in Aquinas' perspective infinite divisibility does not always rank as a definition of continuity, rather simply as a property which is entailed by the definition of continuity.

[292] THOMAS DE AQUINO, *In Aristotelis libros De generatione et corruptione*, Liber I, lectio 5, n. 36, ed. SPIAZZI, p. 339: "Non ergo est possibile neque quod fiat divisio in infinitum *secundum partem*, ita scilicet quod pars post partem a toto sensibili corpore separetur: neque est possibile quod corpus sensibile dividatur simul secundum quodcumque signum (neutrum enim horum est possibile, quia utrobique videtur sequi praedictum inconveniens): sed videtur quod divisio corporis sensibilis possit procedere usque ad aliquem terminum. Unde sequitur quod necesse sit aliquas magnitudines esse indivisibiles, et aliqua corpora indivisibilia, secundum Democritum."

interpret it along lines which are different from those of Albert (whose reference to incompossible propositions, and to modal logic more generally, is completely absent from Aquinas' text) and of previous commentators:

> Concerning the first [argument introduced by Democritus against the notion of potential infinite divisibility of points in a line adopted by Aristotle, i.e., that everything which is together in potency can be actualised together[293]] it must be considered that all the force of Democritus' first argument consists in this, that if a sensible body is totally divisible in potency together, it is also totally divided in act together. But this consequence does not hold in all things. Some, indeed, are such that it is in their definition (*ratio*) to be in potency: hence in such things it cannot be posited that it can all be together in act what is together in potency, because it would be removed the definition and nature of that thing. [A consideration] which is first truly clear in successive [things]. Indeed, in the first part of the day it is possible that the [successive] hours of the day are together: however, it cannot be posited that all the hours of that day are together in act; it would indeed be removed the nature of time, of whose definition it is proper that it is the number of motion according to before and after; if, indeed, every part of it had been together, then it would not have been according to before and after. Secondly, this [i.e., the fact that not all things which are together in potency are together in act] appears in permanent things. Indeed, it is proper of the substance of air [to have] a matter which is in potency to every form: nevertheless, it cannot be posited that it is generated from air everything which can be generated from it; because then it would be removed the nature of matter, which is always in potency to every form. In this way, therefore, it is against the definition of magnitude, for instance of line, that it be totally divided together in act: hence it does not follow, if it is totally divisible together in potency, that it can be posited totally divided together in act. It is clear that this is against the definition of line. Indeed, the division of a line in act is nothing else than a point in act: if, therefore, a line were totally divided together in act, it would be needed that there be everywhere a point in act in the line, and so it would be needed that points be contiguous or successive in the line. This, however, cannot be: because, since points are indivisible, one of many contiguous points would not exceed another, because one would touch the other according to its totality; and so all the points would not be if not one single point. Therefore it cannot be that points are everywhere in act in a line: and so it is against the definition of a line that it be totally divided together in act. And in this way it does not follow that, if it is totally divisible together in potency, it can be posited to be totally divided in act[294].

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[293] THOMAS DE AQUINO, *In Aristotelis libros De generatione et corruptione*, Liber I, lectio 5, n. 36, ed. SPIAZZI, p. 338: "Credebat enim Democritus quod quidquid esset simul in potentia, posset esse simul in actu: et argumentabatur, sicut est possibile simul in potentia corpus sensibile omnino dividi, quod hoc fieret in actu; non quidem ita quod esset simul in potentia divisibile et actu divisum, sed quod esset simul divisum actu, secundum quodcumque signum."

[294] THOMAS DE AQUINO, *In Aristotelis libros De generatione et corruptione*, Liber I, lectio 5, n. 38, ed. SPIAZZI, p. 339: "Circa primum est considerandum quod tota virtus primae rationis Democriti in hoc consistit, quod si corpus sensibile est simul omnino divisibile in potentia, quod sit simul omnino divisum actu. Sed haec consequentia non tenet in omnibus. Quaedam enim sunt, de quorum ratione est esse in potentia: unde in talibus non potest poni esse simul in actu quod est simul in potentia, quia auferretur ratio et natura illius rei. Quod quidem primo manifestum est in successivis. In prima enim parte diei simul possibile est esse horas diei: non tamen potest poni quod omnes horae illius diei sint simul actu; auferretur enim natura temporis, de cuius ratione est quod sit numerus motus secundum prius et posterius; si enim

As Aquinas rightly notes, the strength of the "atomistic dilemma" as an objection to the idea that continuous magnitudes are (potentially) infinitely divisible stems from the premiss that it must be possible to actualise together everything that is in potency together, and that therefore, in the case at hand, if a continuous magnitude (Aquinas, significantly, focuses here on the case of "enmattered" magnitudes) is in potency to being divided everywhere, it must be possible to divide it everywhere in act. Nevertheless, previous commentators, up to and including Albert, tended to reply to this objection, following Aristotle, by showing why the specific notion of potency used in the concept of the (potential) infinite divisibility of continuous magnitudes can never be actualised. Aquinas, instead, before doing so, inserts two examples aimed at demonstrating that the premiss from which the "atomistic dilemma" stems is false *in its general form*. That is to say, according to Aquinas it is false, as a general principle, that it must be possible to actualise together everything that is in potency together. On the contrary, for some entities (among which Aquinas counts continuous magnitudes), the possibility to actualiste together all the parts of such entities is contrary to their definition.

The first example provided by Aquinas concerns successive entities, i.e., entities whose parts do not exist at the same time. In this case, it is immediately evident that the impossibility to actualise together what is in potency together stems from the definition of 'successive'. Indeed, if all the parts of a successive entity were actualised together, then such an entity would not be successive anymore. In particular, the example presented by Aquinas concerns the case of time, and, specifically, the case of the actualisation of the successive hours of a day. As Aquinas rightly remarks, it is contrary to the very definition

esset simul quaelibet pars eius, iam non esset secundum prius et posterius. Secundo apparet hoc in permanentibus. De substantia enim aëris est materia, quae est in potentia ad omnes formas: tamen non potest poni quod ex aëre sit generatum quidquid ex eo potest generari; quia iam tolleretur natura materiae, quae semepr est in potentia ad omnes formas. Sic igitur contra rationem magnitudinis, ut puta lineae, est, quod sit simul omnino actu divisa: unde non sequitur, si est simul omnino divisibilis in potentia, quod possit poni simul omnino actu divisa. Quod hoc sit contra rationem lineae, patet. Nam divisio lineae in actu nihil aliud est quam punctus in actu: si ergo linea esset simul omnino in actu divisa, oporteret quod punctus esset ubique in actu in linea, et ita oporteret quod puncti essent contigui vel consequenter se habentes in linea. Hoc autem non potest esse: quia, cum puncta sint indivisibilia, multorum punctorum contiguorum unum non excederet aliud, quia unum tangeret aliud secundum se totum; et et (*sic!*) ita omnes puncti non essent nisi unus punctus. Non ergo potest esse quod puncti sint ubique in actu in linea: et ita contra rationem lineae est quod sit simul omnino divisa in actu. Et ita non sequitur quod, si sit simul divisibilis omnino in potentia, quod possit poni omnino esse divisa in actu."

of time as the number of the motion according to the before and the after that the hours of a day are actualised together.

The second example presented by Aquinas focuses, instead, on permanent entities, i.e., the entities whose parts exist at the same time, among which continuous magnitudes are to be counted. Aquinas' example concerns the case of air, an elemental material substance, but the example could be extended to any material substance whatsoever. Aquinas' reasoning is rather convoluted at this point, but the example can be reconstructed as follows. As Aquinas notes, it is true that the matter of any hylomorphic compound is always in potency to any substantial form whatsoever (else it would not be possible for it to be informed by such a substantial form through a process of substantial change). Nevertheless, it is not possible that such a matter is informed by all the substantial forms to which it is in potency (strictly speaking, according to Aquinas' defence of the view of the unicity of the substantial form of any hylomorphic compounds, he is committed to the stronger claim that the matter of a hylomorphic compound cannot even be informed in act by more than one substantial form).

It is only at this point that Aquinas shifts its focus directly on the case of continuous magnitudes, focusing on that of the line, which is at the centre of *De generatione* I.2. Here, again, his reasoning is not immediately clear. Nevertheless, his argument can be understood in the following way. Given that a line is defined as a continuous extension in one dimension between two points conceived as extremities, the idea that a line is everywhere (i.e., in every of its points) divided in act, although it is everywhere divisible in potency, is contrary to its definition[295]. Indeed, if all the points in a given line were actualised together by division, even points "immediately next" to each other, then, insofar as points are unextended entities, they would necessarily touch "whole to whole" (as Aristotle puts it in *Physics* VI.1) and become co-located, and, as a result, the original line comprised between two extremities would collapse into a single, unextended point[296].

[295] Aquinas also notes, in this respect, that here lies the 'paralogism' identified by Aristotle in Democritus' argument (cf. THOMAS DE AQUINO, *In Aristotelis libros De generatione et corruptione*, Liber I, lectio 5, n. 39, ed. SPIAZZI, pp. 339-340).

[296] That this is the correct interpretation of Aquinas' argument is confirmed by a passage of the same *lectio* in which Aquinas explicitly rephrases his argument by making explicit reference to the position (*situs*) of points in a line throughout its division: "Sed hoc (i.e., the total division of a line in act) non potest esse: quia sequeretur quod solum unus punctus esset *ubique*, idest in qualibet parte lineae; et quod omnes puncti lineae non plus continerent de situ quam unusquisque eorum; immo quod non essent plures quam unus, vel

Aquinas' complex reasoning is therefore less faithful to the Aristotelian text than Albert's (and Averroes') ones. Nevertheless, the approach taken by Aquinas becomes rather comprehensible when it is understood as part of his overall theoretical strategy to argue against the premiss from which the "atomistic dilemma" stems in its general form.

This said, as mentioned above, Aquinas' position presents also important elements in common with those of Albert (and Averroes), insofar as it also recognises some important distinctions between the analysis of the continuity of mathematical (geometrical) and of sensible entities[297], as seen in his commentary on *Physics* V.3, at least in the interpretation presented above, according to which touching is, for Aquinas, strictly speaking a property belonging exclusively to mathematical (geometrical) entities[298]. The attention to mathematics, or, better, to geometry in the context of the study of continuity is a general attitude in 13th-century Latin Aristotelian commentators, one which would find its most complete and refined expressions in John Duns Scotus.

1.5.3. John Duns Scotus

John Duns Scotus (1265/1266-1308) did not devote any commentary, at least any extant one, to either the *Physics* or the *De generatione*, although he did comment on the *Categories*[299] and on the *Metaphysics*[300]. Still, in addition to these texts, the issue of

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plures divisiones quam una. Non enim possunt se habere consequenter, ita quod punctus unus sit post alium, neque quod se tangant secundum ultima tantum, et secundum alia secernantur; quia, cum sint indivisibiles, secunudm totum coniunguntur: et ideo omnes puncti sic coniuncti non sunt nisi unus. Et ideo non est possibile quod punctus sit ubique in linea" (THOMAS DE AQUINO, *In Aristotelis libros De generatione et corruptione*, Liber I, lectio 5, n. 39, ed. SPIAZZI, pp. 339-340).

[297] Although Aquinas, contrary to Albert, seems to be in no significant way influenced by the geometrical tradition stemming from Euclid's *Elements*.

[298] At the same time, the analysis conducted above makes clear that there are, throughout the 13th century, various theoretical oscillations concerning the interpretation of the Aristotelian texts related to continuity. This is certainly the case for *Physics* V.3, which had not found a single "orthodox" intepretation even in the Late Ancient and Arabic tradition, but it is the case of *De generatione* I.2 as well, as just seen.

[299] Scotus' question commentary on the *Categories* has been edited as part of his *Opera Philosophica* by the Franciscan Institute of St. Bonaventure, NY, as IOANNES DUNS SCOTUS, *Quaestiones in Librum Porphyrii Isagoge et Quaestiones super Praedicamenta Aristotelis (Opera Philosophica Vol. I)*, ed. R. ANDREWS, G. ETZKORN, G. GÁL, R. GREEN, T. NOONE, R. WOOD, St. Bonaventure, NY, Franciscan Institute Publications, 1999. An English translation of the work has appeared as JOHN DUNS SCOTUS, *Questions on Aristotle's* Categories *(The Fathers of the Church – Mediaeval Continuation Vol. 15)*, L.A. NEWTON (trans.), Washington, DC. The Catholic University of America Press, 2014. For an introduction to the commentary, read in relation with the previous 13th-century commentary tradition on the *Categories*, see G. PINI, *Categories and Logic in Duns Scotus. An Interpretation of Aristotle's* Categories *in the Late Thirteenth Century (Studien und Texte zur Geistesgeschichte des Mittelalters LXXVII)*, Leiden, Brill, 2002.

[300] Scotus' major commentary on the *Metaphysics* are the *Quaestiones super Aristotelis Metaphysicam*, which have been critically edited in two volumes as IOANNES DUNS SCOTUS, *Quaestiones super libros*

continuity features prominently in a passage of Scotus' *Ordinatio*, II, d. 2, a. 2, q. 5[301], which will also be at the centre of the next chapter, and which exerted an extremely important influence on the subsequent Latin debate on the issue of continuity[302]. Therefore, in what follows I will focus extensively on the discussion of the continuity of magnitudes and of their (potential) infinite divisibility in Scotus' *Ordinatio* (which is in any case the theoretically richer and the most extended one in his *corpus*), simply adding to it a few introductory remarks concerning Scotus' discussion of the same issues in his commentaries on the *Categories* (I leave aside, instead, Scotus' discussion of the same

Metaphysicorum Aristotelis. Libri I-V (Opera Philosophica Vol. 3), ed. R. ANDREWS, G.J. ETZKORN, G. GÁL, R. GREEN, F.E. KELLY, G. MARCIL, T.B. NOONE, R. WOOD, St. Bonaventure, NY, Franciscan Institute Publications, 1996, and IOANNES DUNS SCOTUS, *Quaestiones super libros Metaphysicorum Aristotelis. Libri VI-IX (Opera Philosophica Vol. 4)*, ed. R. ANDREWS, G.J. ETZKORN, G. GÁL, R. GREEN, F.E. KELLY, G. MARCIL, T.B. NOONE, R. WOOD, St. Bonaventure, NY, Franciscan Institute Publications, 1997. Apart from his major commentary, Scotus kept a series of working notes on his copy of the *Metaphysics* which have been recently discovered and critically edited by Giorgio Pini as IOANNES DUNS SCOTUS, *Notabilia super Metaphysicam (Corpus Christianorum Continuatio Mediaevalis 287)*, ed. G. PINI, Turnhout, Brepols, 2017. Three other works on the *Metaphysics* have been wrongly attributed to Scotus (see, on the issue, B. GÖLZ, *Die echten und unechten Werke des Duns Scotus nach dem gegenwärtigen Stand der Forschung*, in *Sechste und siebte Lektoren Konferenz der deutschen Franziskaner für Philosophie und Theologie*, Werl i. W., 1934, pp. 53-60). For an overview of the contents of Scotus' *Quaestiones* on the *Metaphysics*, see especially G. PINI, *The Questions on the* Metaphysics *by John Duns Scotus: A Vindication of Pure Intellect*, in GALLUZZO, AMERINI (eds.), *A Companion to the Latin Medieval Commentaries on Aristotle's* Metaphysics, *op. cit.*, 2013, pp. 359-384. For the complex textual history and an introduction to the *Notabilia*, see G. PINI, "*Notabilia Scoti super Metaphysicam*: una testimonianza ritrovata dell'insegnamento di Scoto sulla *Metafisica*", *Archivum Franciscanum Historicum* 89, 1996, pp. 137-180.

[301] For the critical edition of the relevant part of Scotus' *Ordinatio*, see IOANNES DUNS SCOTUS, *Ordinatio. Liber secundus, a distinctione prima ad tertiam (Doctoris Subtilis et Mariani Ioannis Duns Scoti Ordinis Fratrum Minorum Opera Omnia VII)*, Studio et cura Commissionis Scotisticae, Civitas Vaticana, Typis Polyglottis Vaticanis, 1973.

[302] In spite of its prominence and its influence on subsequent commentators, Scotus' doctrine of continuity has not been the subject of many studies. In recent decades, apart from two contributions dealing specifically with Scotus' account of the continuity of time and its posterity (cf. Z. WLODEK, "Une question scotiste du XIVe siècle sur la continuité du temps", *Mediaevalia Philosophica Polonorum* 12, 1967, pp. 117-134, and U.R. JECK, Tempus continuum – tempus discretum*: Zum Problem der Kontinuität der Zeit in der Philosophie des Johannes Duns Scotus und der Scotisten*, in E. ALLIEZ, G. SCHRÖDER, B. CASSIN, G. FEBEL, M. NARCY (eds.), *Metamorphosen der Zeit (Ursprünge der Moderne 2)*, München, Fink, 1999, pp. 261-275) the only three significant works dealing with Scotus' account of continuity I am aware of are R. CROSS, *The Physics of Duns Scotus. The Scientific Context of a Theological Vision*, Oxford, Clarendon Press, 1998, especially chs. 7-8, R. PODKOŃSKI, *Al-Ghazali's* Metaphysics *as a Source of Anti-atomistic Proofs in John Duns Scotus's* Sentences *Commentary*, in A. SPEER, L. WEGENER (eds.), *Wissen über Grenzen. Arabisches Wissen und lateinisches Mittelalter (Miscellanea Mediaevalia 33)*, Berlin, de Grutyer, 2006, pp. 612-625, and C. TRIFOGLI, "Duns Scotus and the Medieval Debate about the Continuum", *Medioevo. Rivista di storia della filosofia medievale* XXIX, 2004, pp. 233-266. In what follows I will rely on the general framework established by Cross, while, at the same time, trying to provide a close textual analysis of the passages of more relevance for this thesis, passages on which Cross does not focus extensively (a limit which is only partially overcome by Podkoński). In this way, it should be possible to avoid any overlap with his fundamental work. Note that, instead, Trifogli does analyse in some detail a significant number of the passages I will focus on, but what she says is to be considered as complementary to what I will say.

issues in commenting on the *Metaphysics*, since it does nto add any element which is crucial to the purposes of the chapter).

For what concerns Scotus' question commentary on the *Categories*, it should be remarked that, at least in the analysis of chapter 6, Scotus is far more interested into the logical-metaphysical issue of whether 'quantity' can be considered to be a unified genus than in analysing the features of the *differentiae* within that genus, most prominently that between continuous and discrete quantities[303]. Still, Scotus inserts some interesting remarks on the notion of continuity throughout, remarks which are symptomatic of the prevailing views on the issue at the end of the 13th-century, insofar as the originality of Scotus' thought is still not predominant in this commentary.

Firstly, Scotus' general attitude in commenting on *Categories* 6 is to take continuity as being identified by (potential) infinite divisibility, following an interpretative trend dating back at least to Porphyry's commentary in Late Antiquity, as seen above, and present in two commentaries to which Scotus had access, namely, Simplicius' and Boethius' ones. Scotus, therefore, clearly shows how close the two concepts were in the Medieval Latin tradition of the end of the 13th century. The passage which makes it more evident is the one, in the *determinatio* of the first two *quaestiones* on continuity, qq. 16-17, where Scotus explicitly refers to the traditional Aristotelian definition of continuity as those things whose extremities are one. Indeed, Scotus consciously explains such definition as implying divisibility along these same extremities:

> Second, it is shown [i.e., that divisibility is the propre nature of the genus of quantity] <in this way>: since continuous and discrete quantity are not defined here through measure, but through this: 'of which the parts are joined together', etc. [cf. *Categories* 6, 4b25-5a14] Therefore, the essence of them is to be partible[304].

[303] Other topics of relevance to Scotus' natural philosophy are also discussed at some length in the commentary, such as the nature and character of place, to which Scotus dedicates qq. 21-23 of the commentary. This is an interesting aspect also in that Scotus here seems to fully reject the notion of place as a three-dimensional entity (professing instead his strict adherence to Aristotle's notion of two-dimensional place as presented in *Physics* IV.1-5) to which he would come much closer in later works.

[304] IOANNES DUNS SCOTUS, *Quaestiones super Praedicamenta Aristotelis*, q. 17, *determinatio*, ed. ANDREWS, ETZKORN, GÁL, GREEN, NOONE, WOOD, p. 395, ll. 18-20: "Secundo ostenditur: quia quantitas continua et discreta non definiuntur hic per mensuram, sed per hoc 'quorum partes copulantur' etc. Igitur de eorum essentia est esse partibile" (the English translation is taken from JOHN DUNS SCOTUS, *Questions on Aristotle's* Categories, NEWTON (trans.), *op. cit.*, p. 182).

When it comes to the interpretation of the notion of (potential) infinite divisibility, however, Scotus also shows important elements of originality. In q. 16 of his commentary, the first concerned with *Categories* 6, on whether quantity is a genus, Scotus inserts an argument (the second *quod non*) where he remarks that continuous and discrete quantities, the alleged species of quantity, are not truly so, because a quantity is continuous insofar as it is "prior to division", while it can only be meaningfully called 'discrete' after it has been divided[305]. In a subsequent passage of his discussion, however, Scotus presents a refined understanding of the notion of (potential) infinite divisibility as it applies to a continuum, one which is certainly indebted to the previous commentary tradition of the 13th century:

> To the second <argument>, one can say that the act of this potency, <namely,> "a continuum is divisible", is not this: "a continuum is divided", but this: "a continuum is being divided," that is, it is in the process of division (*in fieri divisionis*); and this can be essentially (*per se*) in a continuum[306].

The concept of the (potential) infinite divisibility of the continuum is here reconducted by Scotus to that of being *in fieri divisionis*, a fundamental expression frequently employed by Medieval Latin Aristotelian commentators with reference to (potential) infinite divisibility. The (potential) infinite divisibility of a continuous entity, therefore, is only actualised throughout a process that, by definition, can never be completed. The idea is not, clearly, that a continuum is always being divided, rather, that when it is in the process of division, the process can never be completely actualised, due (in the case of enmattered magnitudes) to the weakness of the dividing agent, which is always of finite power, and moreover, for any kind of magnitude considered, to the impossibility to divide

[305] IOANNES DUNS SCOTUS, *Quaestiones super Praedicamenta Aristotelis*, q. 16, *quod non*, ed. ANDREWS, ETZKORN, GÁL, GREEN, NOONE, WOOD, p. 391, l. 17-p. 392, l. 3: "Item, quantitas non habet species, quia de continua et discreta non praedicatur aequaliter; et genus aequaliter praedicatur de speciebus. Probatio assumpti: quia quantitas continua est naturaliter prior sua divisione, quia in quantum continuum est divisibile, est naturaliter prius sua divisione. Igitur et continuum est prius numero, quia numerus est posterior divisione continui, cum causetur ex illa, per Aristotelem III *Physicorum* [cf. *Physics* III.7, 207a32-b2]." This understanding of the distinction between continuous and discrete quantities might derive, once again, from Simplicius' commentary on the *Categories*, where, as seen above, it also features.

[306] IOANNES DUNS SCOTUS, *Quaestiones super Praedicamenta Aristotelis*, q. 17, *determinatio*, ed. ANDREWS, ETZKORN, GÁL, GREEN, NOONE, WOOD, p. 396, l. 20-p. 397, l. 2: "Ad secundum dici potest quod actus huius potentiae 'continuum est divisibile' non est iste 'continuum est divisum', sed iste 'continuum dividitur', id est, est in fieri divisionis; et illud potest per se inesse continuo" (the English translation is taken from JOHN DUNS SCOTUS, *Questions on Aristotle's* Categories, NEWTON (trans.), *op. cit.*, p. 183).

a magnitude at any two points "immediately next" to each other. Yet, insofar as the process of division can be actualised, a continuum can be meaningfully said to have been divided (and therefore it is not to be described as that which is "prior to division"). Still, it must be kept in mind, according to Scotus, that the result of the division is always something which is further divisible. Scotus, in the context of his commentary on the *Categories*, of course, does not differentiate between mathematical (geometrical) and physical divisibility in respect of the continuum, yet the fact that he stresses the notion of the continuum as something whose process of division is always *in fieri* can be taken as an early hint to his strong "divisibilist" position, whose full import will be made clear below by discussing the relevant passages from his mature *Ordinatio*, to which it is now possible to turn.

The passage from the *Ordinatio* concerned with continuity (and also, as it will be shown in the next chapter, also with hylomorphic *minima*) is part of Scotus' discussion of the physics of angels. After having discussed whether angels can be in a place, Scotus turns to the issue of the motion of angels, and he asks whether angels (considered as indivisible entities) can move of a continuous motion[307]. Scotus' decision to discuss this issue is, of course, not original. Aquinas, Henry of Ghent and numerous other theologians had already discussed it in their own *Sentences* commentaries and even in their *Quodlibeta*. Yet, for Scotus, the very possibility of providing a solution to it requires to establish a general analysis of continuity which, for its length and level of theoretical detail, together with the constant reference to the relevant passages of the Aristotelian *libri naturales*, could rightly be counted as a full-fledged interpretation of the Aristotelian notion of continuity as presented in the *Physics* and in the *De generatione*.

Scotus' *determinatio* starts with a consideration of the issue of the continuity of motion, which is more specifically at hand. Still, its consideration shows a preliminary acceptance of the isomorphism thesis, and, more specifically, of the idea that the continuity of motion is grounded on the continuity of the magnitude over which the motion takes place[308].

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[307] For a discussion of the whole issue, also in relation to the preceding tradition, see R. CROSS, *Angelic Time and Motion: Bonaventure to Duns Scotus*, in T. HOFFMANN (ed.), *A Companion to Angels in Medieval Philosophy*, *op. cit.*, pp. 117-147, and the additional relevant literature quoted in the general Introduction to the thesis.

[308] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 288, l. 19-p. 289, l. 2: "Et quod continue [sc. Quod angelus potest continue moveri ab uno 'ubi' ad aliud 'ubi'], patet, - quia inter duo 'ubi', infinita

After his *determinatio*, Scotus turns to the discussion of the arguments adduced to deny that angelic motion is continuous. In this context, he discusses the second argument presented, which is based on the claim that *nullum successivum* (thus, neither motion nor time) *esse continuum*, and on its premiss, namely, that *successivum componitur ex indivisibilibus*. To reject such claim, Scotus adopts a bipartite strategy. First, in a *pars destruens*, he shows that it is not the case that a *successivum* (and, *a fortiori*, a *permanens*, namely a magnitude) is composed either of unextended, or of extended indivisibles. Then, he adds a *pars construens*, where he specifically demonstrates that magnitudes, motion and time are composed of parts which are always divisible (and, as such, they are potentially infinitely divisible).

Scotus' first move in the *pars destruens* is to recall an argument from *Physics* VI.2, 233b19-32, which concerns specifically the proportion of two motions of different velocities, and also to discuss an argument concerned specifically with the composition of time. It is only at this point, however, that Scotus turns to the question of the continuity of magnitudes more specifically, which, he claims, can be proved more easily than that of motion and of time[309]. In order to prove that magnitude is not composed of indivisibles, Scotus first introduces two geometrical arguments, thus showing that he aims to discuss

sunt 'ubi' media (quod probatur ex continuo motu corporis per omnia illa 'ubi')." The final part of the passage shows some signs of a non-vicious circularity in Scotus' argument: on the one hand, motion is continuous because it occurs over a continuous magnitude (and it is noteworthy, in this respect, that the continuity of magnitude is here characterised in terms of the presence of an infinity of point-like places, or 'ubi', between any two couple of points which represent the starting point and the endpoint of the motion itself: these nonextended places are, indeed, nothing more than the results of the potential infinite divisibility of magnitude). On the other hand, the fact that the magnitude over which motion occurs is continuous is proved by the character of the motion itself. Still, this amounts to nothing more than a restatement of the isomorphism thesis. Although, ultimately, it is the continuity of magnitude that grounds that of motion, the continuity of motion, when independently established, can help in proving the continuity of magnitude. This is in agreement with the idea, mentioned above, that even for Aristotle the isomorphism thesis can be read as a co-implication, so that from the continuity of time it is also possible to derive that of magnitude (and that of motion) (cf. *Physics* VI.2, 233a13-22) and that from that of motion it is possible to derive those of time and of magnitude. That, ultimately, Scotus grounds the continuity of motion (and time) on that of magnitude is also shown by a passage of the *ad secundum* of the same *quaestio*, where he unambiguously claims that: "Istud etiam de successivo [sc. quod successivum est continuum], probo per continuitatem permanentis: quia permanens est continuum, igitur et successivum" (*ibid*., p. 291, ll. 8-9). The isomorphism thesis itself is affirmed a few lines later in the course of the same discussion: "Et istam consequentiam declarat Aristoteles VI *Physicorum*, quod scilicet 'eiusdem rationis est, motum, magnitudinem et tempus componi ex indivisibilibus'" (*ibid*., ll. 19-21).

[309]IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 292, ll. 1-5: "Antecedens [sc. quod magnitudo, motus et tempus non componuntur ex indivisibilibus] probari potest, manifestius de permanentibus quam de successivis, per rationes Aristotelis in VI *Physicorum*, quia magis est evidens et manifestum quod indivisibilia permanentia non faciunt maius, quam de indivisibilibus sibi invicem succedentibus."

the issue of the continuity of magnitudes in an interconnected way (both at the geometrical and at the sensible level – although, in the case of angels, which are indivisible and immaterial entities, it is obvious why geometrical arguments take more prominence)[310]. Here is how Scotus presents the first argument:

> 'Over any centre, occupying any space, it is possible to draw a circle', according to the second definition of Book I of Euclid's *Elements* [cf. *Elements*, I, postulate 3 (I 9)[311]]. Therefore, over any given centre, call it 'A', let us draw two circles: a smaller one, call it 'd', - and a greater one 'b'. If the circumference of the greater is composed of points, let two points immediately next to each other[312] be marked, call them 'B' [and] 'C',- and let it draw a straight line from A to B and a straight line from A to C, according to that definition of Book I of Euclid's *Elements* [which says] "from a point to a point draw a straight line" etc. [cf. *ibid*., postulate 1 (I 9)]. These straight lines, drawn in this way, will pass in a straight trajectory through the circumference of the smaller circle. I ask therefore whether they will cut it in the same point, or in a different one?[313]

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[310] It is worth remarking that Scotus' reasoning rarely achieves the level of geometrical precision shown by the two arguments used in this context. Commonly, it is thought that the use of geometrical proofs in the context of discussing the composition of magnitudes is due to the influence of the Oxford tradition started by Grosseteste and continued, in a rather different way, by Roger Bacon, to whom the second of these geometrical arguments is almost certainly indebted (cf., for instance, A. CROMBIE, *Medieval and Early Modern Science (Vol. 2)*, Cambridge, MA, Harvard University Press, 1959). Yet, I hope to have shown convincingly that this longstanding prejudice needs not be true, insofar as commentators quite independent from that tradition, such as Albert the Great, were at least as well, if not more, influenced by geometrical reasoning in their analysis of the composition of magnitudes. This skewed historical perspective is, I believe, rather influenced by the distinctively mathematical (better, geometrical) direction that the discussion concerning the composition of magnitudes took at Oxford later in the 14th century. If anything, Scotus is one of the main causes of such a trend, rather than being himself influenced by a preexisting Oxford one.

[311] The fact that Scotus numbers this postulate as the second of Book I of the *Elements*, rather than the third, as in modern editions, might depend on the numbering in the text of the *Elements* he was using. Cf. PODKOŃSKI, *Al-Ghazali's* Metaphysics *as a Source of Anti-atomistic Proofs in John Duns Scotus's* Sentences *Commentary*, *op. cit.*, p. 617, n. 32: "Actually, Scotus refers there to the second postulate and it might have been so numbered in the copy of Elements he had at hand, but in modern editions of Euclid the postulate he invokes is the third one. […] Cf. also: Sir T. L. Heath (transl. and comm.), Euclid, *The Thirteen Books of the Elements*, vol. 1, New York, 199."

[312] In his presentation of the argument, Cross assumes that here Scotus is talking of points which are merely in succession, and not necessarily contiguous (cf. CROSS, *The Physics of Duns Scotus. The Physical Context of a Theological Vision*, *op. cit.*, p. 122, n. 21). I believe, however, that this is wrong, not only for the internal consistency of Scotus' argument, but also because of Scotus' use of the term *immediata* to refer to points "immediately next" to each other. This term, roughly equivalent to the one of *proxima* used by Albert in his commentary on *De generatione* I.2, and also, as will be mentioned below, by Buridan in his *Physics* commentary, is standardly understood, at the beginning of the 14th century, of referring to contiguous, and not merely successive, points (cf., for instance, Buridan's q. 1 on Book VI of the *Physics*, *secundum ultimam lecturam*, where this understanding is made explicit).

[313] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 292, l. 8-p. 293, l. 2: "'Super centrum quodlibet, quantumlibet occupando spatium, contingit circulum designare', secundum illam petitionem 2° I Euclidis. Super igitur centrum aliquod datum, quod dicatur a, describantur duo circuli: minor, qui dicatur D, - et maior B. Si immediata signentur, quae sint b c, - et ducatur linea recta ab a ad b et linea recta ab a ad c, secundum illam petitionem I Euclidis 'a puncto in punctum lineam rectam ducere' etc. Istae rectae lineae, sic ductae, transibunt recte per circumferentiam minoris circuli. Quaero ergo aut secabunt eam in

The figure envisaged by Scotus is represented by two concentric circles, B and D, with a couple of points, b and c, "immediately next" to each other on the circumference of the outer circle. All the problem is, then, where the two lines drawn from the centre of the circles, a, intersect the circumference of the smaller circle, and, more specifically, whether they intersect it in two different points or in the same one. In the former case:

> (I) If in a different one, then [there will be] as many points in the smaller circle, as in the greater one; but it is impossible that two unequal [entities] are composed of equal parts in magnitude and in number: a point indeed does not exceed a point in magnitude, and the points in a smaller circumference are [by assumption] as many as in the circumference of the greater circle; thus the smaller circumference is equal to the greater one, and as a consequence the part [i.e., the circumference of the smaller circle] is equal to the whole [i.e., the circumference of the greater circle]![314]

The consequence of this first possibility is clear (see Fig. 1 below). for any couple of points which are "immediately next" to each other onto the circumference of the outer (greater) circle, there is a couple of points which are immediately next to each other onto the circumference of the inner (smaller) circle, and, as a consequence, the two circumferences have the exact same number of points, something that implies the contradictory consequence that the smaller circle is equal to the greater one.

eodem puncto, aut in alio?" Note that, in the presentation of Scotus' argument, I use capital letters to refer to points and lowercase ones to refer to circumferences, contrary to what has been done in the Vatican edition.

[314] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 293, ll. 3-8: "Si in alio, igitur tot puncta in minore circulo, sicut in maiore; sed impossibile est duo inaequalia componi ex partibus aequalibus in magnitudine et multitudine: punctus enim non excedit punctum in magnitudine, et puncti in circumferentia minore sunt tot quot in circumferentia circuli maiori; ergo minor circumferentia est aequalis maiori, et per consequens pars est aequalis toti!"

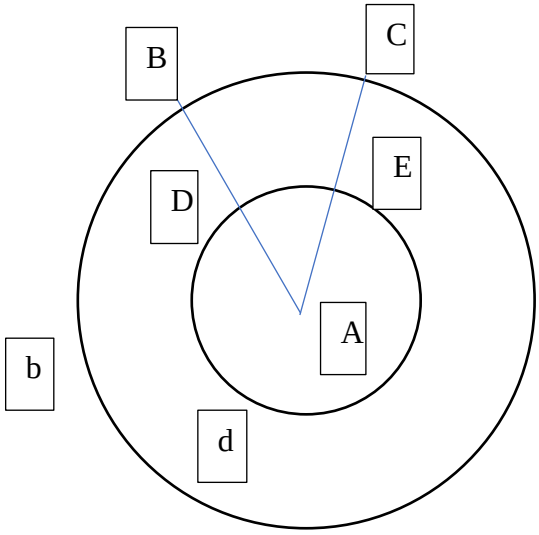

Fig. 1

Scotus then turns to the second possibility, i.e., that the two lines ab and ac intersect the circumference of the smaller circle in the same point:

> (II) If, instead, the two straight lines AB and AC cut the smaller circumference in the same point (be that D), over the line AB let it be constructed a straight line which cuts it in the point D, call it 'DE'[315], - [a line] which let it be also tangent with respect to the smaller circle, according to the 17th proposition of Book III of Euclid's *Elements*. This [line], according to the 13th proposition of Book I of Euclid's *Elements*, forms two straight angles (or two angles equal to two straight ones) with the line AB,-according to the same 13th [proposition], since the line AC (which has been assumed to be a straight [line]) will form [with the line] DE two straight angles (or two angles equal to two straight ones); therefore, the angle ADE and also the angle BDE will have the breadth of two straight angles, - for the same reason the angle ADE and the angle CDE will [also] have the breadth of two straight angles. But any two straight angles are equal to any [other] two straight angles, according to the third definition of Book I of Euclid's *Elements*; thus, subtracted the common [angle] (i.e., ade), the remaining [two] will be equal; therefore the angle BDE will be equal to the angle CDE, and so the part will be equal to the whole![316]

[315] Where E is taken to be the one of the two points where the line DE cuts the greater circumference.

[316] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 293, l. 9-p. 294, l. 3: "Si autem duae rectae lineae ab et act secent minorem circumferentiam in eodem puncto (si tille d), super lineam ab erigatur linea recta secans eam in puncto d, quae sit d e, - quae sit etiam contingens respectu minoris circuli, ex 17° III Euclidis. Ista, ex 13 I Euclidis, cum linea ab constituit duos angulos rectos vel aequales duobus rectis, - ex eadem etiam 13, cum linea ac (quae ponitur recta) constituet de angulos duos rectos vel aequales duobus rectis; igitur angulus ade et etiam angulus bde valent duos rectos, - pari ratione angulus ade et angulus cde, valent duos rectos. Sed quicumque duo anguli recti sunt aequales quibuscumque duobus rectis, ex 3 petitione I Euclidis; igitur dempto communi (scilicet ade), residua erunt aequalia: igitur angulus bde erit aequalis angulo cde, et ita pars erit aequalis toti!"

In this latter case, Scotus could have simply chosen to claim that the two lines AB and AC will not be straight lines anymore, since they coincide from the centre A to the common point where they intersect the circumference of the smaller circle, D, but then start to diverge so as to intersect two different points on the circumference of the greater circle, namely, B and C[317]. Instead, he chooses to embark onto an exercise of Euclidean geometry which shows, among other aspects, the familiarity that Scotus has with the discipline, and the extent to which he sees fit to employ it in the study of the "composition" of magnitudes. His strategy consists, firstly, in drawing the perpendicular to the two coinciding lines AB and AC in the point D, where the two coinciding lines AB and AC, in this second case, intersect the circumference of the smaller circle (see Fig. 2 below). According to postulate 17 of Book III of Euclid's *Elements*, this line is also the tangent to the circumference of the smaller circle in D, and, according to postulate 13 of Book I of the *Elements*, it forms two right angles with the coinciding lines AB/AC (which it should be better to call AD, since, after the point D, the two lines start to diverge from each other and therefore do not coincide anymore). To make Scotus' argument more perspicuous at this point, it might be noted that the tangent to D (what he calls the line DE, taking E, I believe, as one of the two points where the tangent to D intersects the circumference of the greater circle) would form *four* right angles, and not only two (although of course the latter entails the former) with the line AD, if, evidently, one imagines to extend the line AD beyond the point D on the circumference of the smaller circle. Now, as said, however, the two lines AB and AC, according to the assumptions of the argument, must start to diverge from each other somewhere beyond point D but before points B and C on the circumference of the greater circle, otherwise the two points B and C would also be coincident, instead of being "immediately next" to each other. If, however, one admits, according to the construction elaborated up to this point, that the line DE is perpendicular both to AB and to AC, a contradictory consequence ensues. Namely, it is not only the case that the angle ADE (and also the angle ADF, it should be

[317] Indeed, Cross claims that this is exactly Scotus' argument at this point (cf. CROSS, *The Physics of Duns Scotus. The Scientific Context of a Theological Vision*, *op. cit.*, p. 123: "If, on the other hand, *oa* [i.e., AB] and *ob* [i.e., AC] bisect D [i.e., the smaller circumference d] at the same point, then at least one of *oa* and *ob* will fail to be a straight line, which is contrary to the supposition. So the claim that a quantum could be composed of discrete points is false"). Yet, as the quotation makes clear, Scotus has a much more elaborate proof in mind, one which is based on the angles formed by the lines AB and AC and the tangent of the circumference of the smaller circle in D.

added) is a right angle. Rather, also the two angles BDE and CDE (and also the two angles BDF and CDF) should be two right ones, if the line DE is to be perpendicular to AB and to AC, as posited. But if the two angles BDE and CDE (and also the two angles BDF and CDF) are all right angles, they are also equal to each other (while, on the assumptions of the argument, one should be greater than the other), and, moreover, B and C necessarily have to coincide, also contrary to the assumptions of the argument.

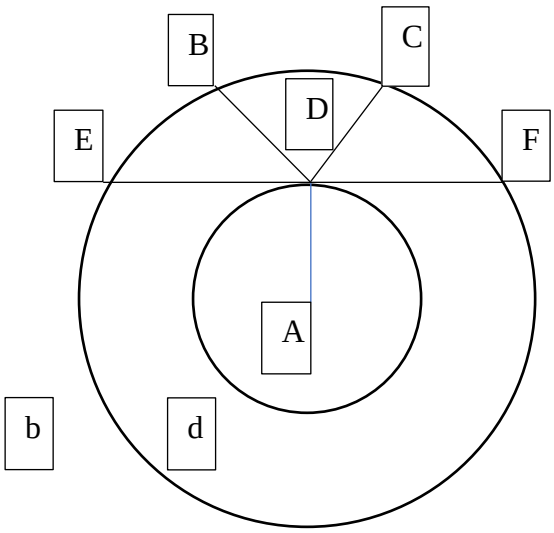

Fig. 2

At this point, however, Scotus notes that his opponent might reply in the following way:

> (IIa) But to this the opponent would reply that DB and DC do not include any angle, because then a basis to that angle could be subtended from the point B to the point C, [something] which is contrary to what has been assumed, because B and C are taken to be points immediately next to each other. When, therefore, it is assumed that the angle CDE is equal (*totalis*) to the angle BDE, it is denied, because in the angle BDE nothing is added from the angle CDE, - because between B and C, in their conjunction in D, there is no angle[318].

This reply is important not only in itself, but also because it explicitly relies on one of the most delicate assumptions of the whole argument, namely, the notion of two points, B and C, being "immediately next" to each other. The idea is that (contrary to the

[318] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 294, ll. 4-10: "Sed ad istud diceret adversarius quod db et dc non includunt aliquem angulum, quia tunc posset illi angulo basis subtendi a puncto b ad punctum c, quod est oppositum positi, quia b et c ponuntur puncta immediata. Quando igitur accipitur quod angulus cde est totalis ad angulum bde, negatur, quia angulo bde nihil additur ex angulo cde, - quia inter b et c, in concursu eorum in d, non est angulus."

Aristotelian notion of point) between B and C there is no line, and, more specifically, no arc of the circumference of the greater circle, if the notion of 'immediately next' (i.e., 'contiguous') to each other is to be taken strictly. If this is so, however, no angle BDC can be individuated, that is to say, it is not truly the case that one of the two angles formed by the line DE and the two lines AB and AC when they diverge from each other after D (call them DB and DC) is greater than the other. Scotus objects vehemently to this reply:

> Although this reply appears at first absurd, since it denies [the existence of] an angle [in the point] where two lines which are extended (*expanduntur*) over a surface and do not directly coincide, and in this contradicts the definition of angle in Book I of Euclid's *Elements*, - denying also that a line can be drawn from B in C, it denies the first postulate of Book I of Euclid's *Elements*, - still, because these [consequences] would not be considered inconvenient (because they are in agreement with what is proposed [i.e., that B and C are immediately next to each other, so that no line can be drawn between them]), I argue against the reply in another way[319].

Scotus' first consideration is sufficient to refute the reply envisaged: indeed, the idea that two lines, DB and DC, which originate from the same point, D, and do not coincide with each other, do not form an angle, is contradictory in itself, since it flies in the face of the Euclidean definition of 'angle' provided in postulate I of Book I of the *Elements*. Here again, Scotus could have contented himself with this rebuttal. Instead, he chooses to embark onto a final refutation which, again, turns onto subtle geometrical considerations:

> The angle CDE includes all the angle BDE, and it adds at least a point (even if you claim that it does not add an angle), and the point is, for you, a part; then the angle CDE adds some part over the angle BDE; then it is a 'whole' [compared] to it [which is a part in its respect]. The assumption is clear, because (1) if an angle is called a space included between [two] lines, without including the lines, - then the first point of the line DB outside the smaller circumference, it will not be anything of the angle BDE, and it will be something of the angle CDE; (2) if an angle, apart from the space included [between two lines], also includes the including lines, - then the first point of the line DC outside of the smaller circumference, will not be anything of the angle BDE, and it will be something of the angle CDE. And so in any of the two ways the angle CDE adds a point over the angle BDE. And one cannot in any way escape to the main demonstration, [by arguing] almost as if the lines would not start to diverge one from the other in this circumference [i.e., the smaller one], but somewhere else, closer to the centre or further [from it], - because wherever you would have posited

[319] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 294, ll. 11-17: "Ista responsio licet primo videatur absurda, negando angulum ubi duae lineae concurrunt quae expanduntur super superficiem et applicantur non directe, et in hoc contradicat definitioni anguli I Euclidis, - negando etiam a b in c lineam posse duci, neget primam petitionem I Euclidis, - tamen quia haec non reputarentur inconvenientia (quia sequuntur ad propositum), arguo contra responsionem aliter."

> this [point of divergence], there I will trace the smaller circumference. It should not even be needed to demonstrate this second part, i.e., that the smaller circumference is not cut in a single point if it is cut by two lines [not coinciding with each other], if not due to the arrogance of the opponent, - because it is evident enough that the same line, if it is traced in a continuous way and in a straight trajectory, will never stop in the same part at two points; and if this is conceded to be the 'evident' truth, immediately by the deduction in the first part [of the argument] the proposed conclusion will appear clear[320].

The refutation starts by Scotus' concession to the opponent that (*per absurdum*) the lines DB and DC do not form an angle. Yet, even if this is so, Scotus argues, it must at least be conceded that one of the two lines is not included in the angle formed by the other with DE (by the assumption that the two lines do not coincide with each other). If, following Scotus, one takes the angle CDE to be the greater one, and the angle BDE to be the smaller one, the line DC is not included in the angle BDE. If this is so, however, even by admitting that it is impossible to individuate an angle BDC, still the two angles BDE and CDE are not equal to each other. This is so both if one chooses to exclude the lines that individuate an angle from its breadth, and if one chooses to include them into it. In the former case, the line DB will not be a part of BDE, but it will be a part of CDE, whose breadth, even if CD is not a part of it, will therefore be greater than that of BDE. In the latter case, BD will be a part of BDE, but CD will not, while it will be a part of CDE, so that CDE will still be greater than BDE. And this, Scotus remarks at the end of the argument, does not depend on where the two lines AB and AC start to diverge. The only assumption that is needed for his refutation is that they start to diverge at a certain point (before intersecting the outer circumference at B and C, respectively). Then, by

[320] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 294, l. 18-p. 295, l. 21: "Angulus cde includit totum angulum bde, et addit saltem punctum (licet protervias quod non addit angulum), et punctus per te est pars; ergo angulus cde addit super angulum bde partem aliquam; ergo est 'totum' ad illud. Assumptum patet, quia si angulus dicatur spatium interceptum inter lineas, non includendo lineas, - tunc punctus primus lineae db extra circumferentiam minorem, nihil erit anguli bde, et est aliquid anguli cde; si angulus, ultra spatium inclusum, includat lineas includentes, - tunc primus punctus lineae dc extra circumferentiam minorem, nihil erit anguli bde, et erit aliquid anguli cde. Et ita utroque modo angulus cde addit punctum super angulum bde. Nec potest aliquo modo obviari demonstrationi principali, quasi in sita circumferentia non incipiant lineae dividi a se, sed alibi, propinquius centro vel remotius, - quia ubicumque hoc posueris, ibi describam circumferentiam minorem. Istam secundam partem, scilicet quod minor circumferentia non secetur in uno puncto si secetur a duabus lineis, non oporteret probare nisi propter proterviam adversarii, - quia satis est manifestum quod eadem linea, si protrahatur in continuum et directum, numquam terminabitur ex eadem parte ad duo puncta; et si istud 'manifestum' verum conceditur, statim ex deductione in prima parte patet propositum."

tracing the inner circumference at the point of divergence, the argument can run its course.

The argument is, it appears, an original creation of Scotus[321]. Still, what is most interesting in it, for the present chapter, is that the reliance on Euclid, and, more in general, the importance given to the Euclidean tradition in this context, attests to a tradition which seems to be somehow in line with what has already been seen in respect of Albert the Great. Yet, in this context, an almost certain source for Scotus' geometrical treatment of the issue of the composition of magnitudes is Roger Bacon, whose *Opus majus* presents a (much simpler) version of the second geometrical argument used by Scotus against the idea that magnitudes are composed of (unextended) indivisibles, namely, the argument concerning the incommensurability of the diagonal and the side of a square. Now, this is not the place to discuss the complex history of this argument in the 13th- and the 14th-century Latin tradition[322], still, it must be remarked that even in this case Scotus' presentation is undeniably much more refined than any of the other versions of the argument known from the Medieval Latin tradition.

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[321] Although Cross thinks of a possible inspiration from the third tractate of Avicenna's *Liber primus naturalium* (see CROSS, *The Physics of Duns Scotus. The Scientific Context of a Theological Vision*, *op. cit.*, p. 123). Avicenna's argument, however, is much simpler than Scotus' complex and refined geometrical construction (cf. AVICENNA, *Liber primus naturalium: Tractatus tertius, De his quae habent naturalia ex hoc quod habent quantitatem*, cap. 4: "The existence of indivisible atoms entails that there can be no circle, [...], for in the case of the circle, the outer perimeter will be greater than the inner perimeter with which it is in contact. But what is in contact must equal that with which it is in contact"; translation taken from DHANANI, *The Physical Theory of Kalām: Atoms, Space, and Void in Basrian Mu'tazilī Cosmology*, *op. cit.*, p. 172). The two arguments share the same basic theoretical insight (i.e., that if circumferences were composed of indivisibles, then the existence of concentric circles will entail a number of contradictions). Still, even if Scotus did indeed know this argument (something which remains to be demonstrated, since, as mentioned above the standard Latin translation of Avicenna's *Liber primus naturalium* stops at the beginning of the third tractate , and the Latin translation of the rest of the third *tractatus*, realised probably between 1275 and 1280, did not enjoy a widespread circulation), it is clear that Scotus' argument retains a rightful claim to originality. The situation would be different if it could be possible to point out some argument which included at least a discussion of Scotus' two basic cases, namely, that of two lines originating in the centre of the circles and intersecting the outer circumference in two different points. However, neither Cross nor Podkoński (who does not even mention Avicenna, nor any other possible source for this argument) have been able to do so, and Trifogli does not even tackle the issue.

[322] On this aspect, see especially GRELLARD, *Les présupposés méthodologiques de l'atomisme: la théorie du continu de Nicolas d'Autrécourt et Nicolas Bonet*, *op. cit.*, pp. 184-186. Grellard remarks that the argument has precedents both in Avicenna and al-Ghazali. The Baconian version of the argument is quoted below in n. 300. For the later history of the argument in the Medieval Latin world, see also, especially, J.M.M.H. THIJSSEN, "Roger Bacon (1214-1292/1297): A Neglected Source in the Medieval Continuum Debate", *Archives internationales d'histoire des sciences* 34, 1984, pp. 25-34. The argument was present in the atomistic debate of the early 14th century, being tentatively refuted both by Nicholas Bonet and Nicholas of Autrecourt. A number of Aristotelian *Physics* commentators, however, kept presenting and endorsing it, in one version or another. I discuss below the case of John Buridan, where I also provide additional secondary literature and further indications concerning the 14th-century masters who used the argument (cf. *infra*).

Scotus' version of the argument runs as follows:

> The second demonstration is taken from the 5th or the 9th [postulate] of Book X of Euclid's *Elements*. That 5th postulate, indeed, says that 'the proportion of all commensurable quantities with each other is such as that of some number to some other number', and as a consequence – such as the 9th postulate wants – 'if some lines are commensurable, the squares of those lines will be in respect with each other such as some squared number to some other squared number'; however, the square of the diameter is not [proportioned] to the square of the side such as some squared number to some other squared number; therefore not even that line, which was the diameter of the square, will be commensurable to the side of that square. The minor [premiss] of this [demonstration] is clear from the penultimate [postulate] of Book I of Euclid's *Elements*, because the square of the diameter is the double of the square of the side, in that it is equal to the square of two sides; however, no squared number is double in respect to any other squared number, such as is clear by looking at all squared [numbers], obtained by any [squared] root whatsoever. From this it follows this conclusion, that the diameter is asymmetrical to the side, i.e., that it is incommensurable [to the side]. If, however, these lines were composed of points, they would not be incommensurable (indeed, they would be such as to have the points of the one in some numerical proportion to the points of the other); and it would not only follow that the lines would be commensurable, but also that they would be equal, - which is evidently contradictory (*contra sensum*). Proof of this consequence. Let two points immediately next to each other (*immediata*) be taken on the side, and two others onto the other side, - and let two straight lines be drawn from these [points on a side] to those points onto the other side, equidistant from the same basis [i.e., parallel to the basis of the square and to each other]. These [lines] will cut the diameter. I ask therefore whether in points immediately next to each other, or not? If in [points] immediately next to each other, then there are no more points in the diameter than in the side; therefore the diameter is not greater than the side. If in points which are not immediately next to each other, I take a point between those two points of the diameter which are not immediately next to each other (that [point] falls outside both lines originating from the given points on the sides of the square). From that point I draw [a line] parallel to both lines (according to the 31st postulate of Book I of the *Elements*); this parallel [line] will be drawn continuously and in a straight trajectory (according to the second part of the first postulate of Book I of the *Elements*): it will cut the side, and in none of its given points, but [in a point] in between them (otherwise it [i.e., this line] would coincide with another [line], with respect to which it has been posited to be parallel, - which is contrary to the definition of 'being parallel', which is the last definition posited in Book I of the *Elements*). Therefore between those two points, which have been posited as being immediately next to each other on the side, there is a middle point: this follows from that which was said that between the points of the diameter there is a middle point; therefore from the opposite of the consequent proposition it follows the opposite of the antecedent one, - therefore etc. Better, more in general, the whole Book X of Euclid's *Elements* contradicts this constitution of a line from points, because then there would not be any irrational or unknown line whatsoever, even though, nevertheless, it [i.e., Book X] discusses mainly of irrationals, such as it is clear there about the many species of irrational lines that it identifies[323].

[323] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 296, l. 1-p. 298, l. 7: "Secunda probatio est ex 5 sive ex 9 X Euclidis. Dicit enim illa 5 quod 'omnium quantitatum commensurabilium proportio est

Now, the argument is certainly much simpler than the previous one, yet it requires another elaborate geometrical construction, which contributes to showing Scotus' familiarity with Euclid's *Elements*. After having briefly recalled the reasons why the diagonal of the square is assumed, in standard Euclidean geometry, to be incommensurable with its side, Scotus imagines drawing two parallel lines from two points on one side of a square (call them A and B) taken to be "immediately next" to each other[324] (see Fig. 3 below). The starting point of the argument is, therefore, analogous to that of the previous one. Moreover, even in this case two lines (parallel to the basis of the square and therefore also to each other) are drawn from A and B to the corresponding two points on the opposite side of the square (call them C and D). Now, the lines AB and CD intersect the diagonal of the square in two different points, call them E and F. Scotus therefore asks

ad invicem sicut alicuius numeri ad aliquem numerum', et per consequens – sicut vult 9 – 'si lineae aliquae sint commensurabiles, quadrata illarum se habebunt ad invicem sicut aliquis numerus quadratus ad aliquem numerum quadratum'; quadratum autem diametri non se habet ad quadratum costae sicut numerus aliquis quadratus ad aliquem numerum quadratum; igitur nec linea illa, quae erat diametri quadrati, commensurabilis erit costae illius quadrati. Minor huius patet ex paenultima I, quia quadratum diametri est duplum ad quadratum costae, pro eo quod est aequale quadratis duarum costarum; nullus autem numerus quadratus est duplus ad alium numerum quadratum, sicut patet discurrendo per omnes quadratos, ex quibuscumque radicibus in se ductis. Ex hoc patet ista conclusio, quod diameter est asymmeter costae, id est incommensurabilis. Si autem lineae istae componerentur ex punctis, non essent incommensurabiles (se haberent enim puncta unius ad puncta alterius in aliqua proportione numerali); nec solum sequeretur quod essent commensurabiles lineae, sed etiam quod essent aequales, - quod est plane contra sensum. Probatio huius consequentiae. Accipiantur duo puncta immediata in costa, et alia duo opposita in alia costa, - et ab istis et ab illis ducantur duae lineae rectae, aequidistantes ipsi basi. Istae secabunt diametrum. Quaero ergo aut in punctis immediatis, aut mediatis? Si in immediatis, ergo non plura puncta in diametro quam in costa; ergo non est diameter maior costā. Si in punctis mediatis, acicpio punctum medium inter illa duo puncta mediata diametri (illud cadit extra utramque lineam, ex datis). Ab illo puncto duco aequidistantem utrique lineae (Ex 31 I); ista aequidistans ducatur in continuum et directum (ex secunda parte primae petitionis I): secabit costam, et in neutro puncto eius dato, sed inter utrumque (alioquin concurreret cum alia, cum qua ponitur aequidistans, - quod est contra definitionem aequidistantis, quae est ultima definitio posita in I). igitur inter illa duo puncta, quae ponebantur immediata in costa, est punctus medius: hoc sequitur ex hoc quod dicebatur inter diametri puncta esse punctus medius; igitur ex opposito consequentis sequitur oppositum antecedentis, - igitur etc. Immo, generaliter, totus X Euclidis destruit istam compositionem lineae ex punctis, quia nulla esset omnino linea irrationalis sive surda, cum tamen ibi principalliter tractet de irrationalibus, sicut patet ibi de multis speciebus lineae irrationalis quas assignat." The Baconian version of the argument in the *Opus maius* runs as follows: "[If] the world is composed of an infinite number of material particles called atoms, as Democritus and Leucippus maintained [...], the diagonal of the square [...] and its side would be commensurable [...]. For if the side has ten atoms, or twelve or more, then let the same number of lines be drawn from those atoms to the same number in the opposite side, the sides of the square being equal; [...] therefore since the diagonal passes through those lines, and no more can be drawn in the square, the diagonal must receive a single atom from each line, and thus they have an aliquot part as a common measure, and the side has just as many parts as the diagonal, both of which conclusions are impossible" (ROGERUS BACON, *The* Opus Maius *of Roger Bacon (vol. 1)*, R.B. BURKE (ed. and transl.), New York, NY, 1962, p. 173).

[324] In this case, as with the previous argument, I take the points to be contiguous, and not merely in succession.

whether E and F are also immediately next to each other, such as A and B and C and D respectively, or not. If they are, then, the diagonal has exactly the same number of points as the sides of the square, therefore it is not longer than them, something which is contrary to Euclidean geometry. If, however, there is an intermediate point between E and F, call it G, then it is possible to trace a line which includes G and which, being parallel to the basis of the square, is also parallel to both AB and CD. If this is so, however, this line must intersect the two opposite sides of the square at two points which are themselves intermediate between AB and CD respectively, call them H and I. Thus, A and B (and C and D, and, indeed, any couple of points taken to be "immediately next" to each other on the side of a square) would not truly be "immediately next" to each other, or a patent contradiction will ensue (namely, that two parallel lines, HI and AB, or HI and CD, will coincide with each other). Scotus also adds an important final remark, by noting that, apart from the case of the proportion between the diagonal and the side of the square, any irrational proportion between two geometrical entities (i.e., any couple of two geometrical entities which are incommensurable with each other) contradicts the claim that magnitudes are composed of indivisibles.

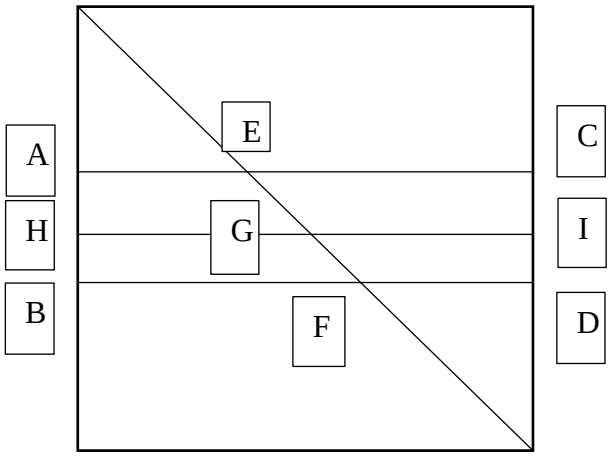

Fig. 3

At this point, however, Scotus is not content of affirming that magnitudes cannot be composed of unextended indivisibles, that is, geometrical points[325]. In the following

[325] According to Cross, both geometrical arguments presented by Scotus are valid against the idea of the composition of magnitudes out of a finite number of unextended indivisibles, but not for that out of an infinite number of them, assuming, of course, the possibility of unequal infinites, something to which,

section of his *pars destruens*, he explicitly takes into consideration the hypothesis that magnitudes are composed of extended indivisibles, which he interestingly calls *minima*. Now, this is probably the first systematic discussion of the composition of magnitudes out of indivisibles which explicitly distinguishes the two different possibilities of their composition out of unextended indivisibles (that is, geometrical points), and of extended indivisibles. Of course, the originality of Scotus' systematisation does not consist in a mere distinction between geometrical and "physical" indivisibles, something which is already present in Aristotle, as it has been shown above. Rather, Scotus' distinction cuts across that between geometry and natural science. Indeed, although unextended indivisibles cannot be instantiated by enmattered bodies, the same does not hold for Scotus' *minima* (extended indivisibles). Scotus, indeed, presents two separate refutations of the composition of magnitudes out of *minima*, one which refers specifically to geometrical *minima*, and the other to hylomorphic *minima*, i.e., what can be reasonably called *minima naturalia*. The fact that Scotus groups together two cases which, as it has been claimed since the outset of this chapter, are theoretically different, might be confusing. However, from the course of the discussion it is clear enough that Scotus interprets *minima naturalia* (contrary to geometrical *minima*) as limits to the persistence of material substances (and as entities which are still divisible in themselves), and, as such, he confirms the interpretation I have advanced. Moreover, Scotus explicitly acknowledges that infinite divisibility cannot be conceived of as a property pertaining only to geometrical entities, and not to enmattered bodies, unless, of course, the

however, Scotus does not make reference in this context. Cf. CROSS, *The Physics of Duns Scotus. The Scientific Context of a Theological Vision*, *op. cit.*, pp. 124-125: "What Scotus's arguments do not exclude, however, is the sort of position espoused by his eminent Oxonian predecessor Robert Grosseteste. According to Grosseteste, a quantum is composed of an infinite number of unextended points. Grosseteste appeals to the possible inequality of infinites to explain the empirically evident difference in size between different quanta. Scotus was aware of the possibility of an appeal to unequal infinites, and in a passage which has not been noticed in the literature argues that such an appeal can legitimately be made by someone anxious to defend the eternity of the world. Given this, Scotus cannot have believed his arguments to be effective against a quantum's being composed of an infinite number of points; from which we can infer that he did not attribute this view to his opponent here." The passage to which Cross refers is cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 1, q. 3, n. 171, p. 87, ll. 4-9: "Istam rationem 'de infinito successivo' confirmat illa imaginatio de linea conversa: quia si aliqua linea esset protensa quasi in infinitum, incipiens ab hoc puncto a, non esset possibile quod esset pertransita; ergo videtur quod etiam e converso, imaginando lineam quasi sit accepta in praeteritum, non videtur possibile quod sit accepta usque ad a." Note, however, that Trifogli has recently objected to Cross' position, claiming, instead, that Scotus' arguments are valid both for a finite and for an infinite number of unextended indivisibles, insofar as the bijection between two sets of points on which the geometrical constructions of both arguments rely can be established in both cases (cf. TRIFOGLI, "Duns Scotus and the Medieval Debate about the Continuum", *op. cit.*, pp. 241-248). I need not take position on this complex issue here.

distinction is meant to imply that such a property pertains essentially to geometrical entities, and only accidentally to enmattered bodies[326]. While I leave the discussion of Scotus' views on *minima naturalia* (which extends also to *minima* in motion) to the next chapter of the thesis, it is important here to summarise Scotus' views pertaining directly to the issue of the composition of (geometrical) magnitudes out of extended indivisibles. Scotus' argumentative strategy against the composition of geometrical magnitudes out of extended indivisibles is, *mutatis mutandis*, analogous to that employed against the composition of magnitudes out of geometrical points, therefore employing a version of the same two arguments illustrated above[327].

After this *pars destruens*, aimed at demonstrating that a continuum cannot be composed either of nonextended or of extended indivisibles, Scotus starts his *pars contruens*, dedicated to demonstrating, positively, that a continuum is composed of parts which are always divisible (and, therefore, that a continuum is infinitely divisible). This section takes its starting point from an analysis of the notion of (potential) infinite divisibility which Aristotle thinks is implied by that of continuity. Here, therefore, Scotus

[326] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 305, l. 10-p. 306, l. 6: "Dico igitur quod ista responsio de naturali in quantum 'quantum' et in quantum 'naturale', si potest habere aliquam veritatem, debet intelligi affirmando et negando rationem formalem divisibilitatis, ita quod illa quae dicit quod dividitur in quantum 'quantum', dicit quod dividitur in quantum 'naturale', et quae dicit quod non dividitur in quantum 'naturale', negat naturalitatem esse rationem huius divisionis, - sicut si diceretur quod animal in quantum habet oculos videt, non in quantum habet manus; et iste intellectus verus est. Sed ex hoc non sequitur quod non simpliciter ei conveniat quod convenit ei secundum quantitatem: non enim per naturalitatem concurrentem impeditur illud quod convenit naturaliter quantitati, sicut nec per manus concurrentes in animali tollitur illud quod simpliciter convenit ei secundum oculos. Ita igitur, absolute, est omne 'naturale' divisibile in semper divisibilia (in infinitum) sicut si illa quantiats quae est cum forma naturali esset per se, sine omni forma naturali. Et ita omnes rationes quae procedunt de quantitate absolute (secundum rationem quantitatis), concludunt de ea ut est in naturalibus, quia divisibilitas est passio naturalis eius, - et ex consequente concludunt de naturali, cuius est haec passio."

[327] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 298, l. 9-p. 300, l. 3: "Ex eodem etiam apparet improbatio alterius antecedentis, de partibus minimis, - quia aut illud minimum posset praecise terminare lineam indivisibilem simpliciter, aut posset intercipi inter terminos duarum linearum? Si primo modo, minimum ponitur simpliciter punctus indivisibilis; et tunc idem est ponere, illo modo, minimum et simpliciter indivisibile pro parte. Si secundo modo, ducantur igitur duae lineae – protractae a centro – ad terminos talis minimi in circumferentia maiore, ita quod includant praecise tale minimum in illa circumferentia. Tunc quaero: aut includunt aliquid minimum in circumferentia minore, aut praecise nihil includunt, sed omnino habent idem indivisibile continuans? Si primo modo, igitur tot minima in minore circulo quot sunt in maiore; igitur erunt aequales. Si secundo modo, sequitur quod circumferentia minor secabitur in uno puncto a duabus lineis rectis (exeuntibus ad eodem puncto), quod est improbatum in primo membro. – Immo sequitur absurdius, quod scilicet istae in circumferentia maiore includant illud minimum: et ducatur a termino unius ad terminum alterius linea recta, secundum primam petitionem I; et tunc illa erit basis trianguli duorum laterum, et per consequens poterit dividi in duo aequalia (ex 10 I); et ita non erit minimum, quod datum est minimum. Immo ulterius: ducatur aliqua alia, aequidistans illi basi trianguli, illa erit minor illa base (ex 21 I), et ita erit aliquid minus minimo. Similiter, illa positio, sive uno modo sive alio (si tamen intelligatur tale quod non habet partem in toto), concludit commensurabilitatem diametri ad costam (immo aequalitatem), sicut deductum est prius, contra primam opinionem."

plunges into a detailed discussion of Aristotle's notion of (potential) infinite divisibility, which comes close to constituting a sustained commentary of Aristotle's solution to the "atomistic dilemma" presented in *De generatione* I.2 (significantly, Scotus quotes Averroes' interpretation of such passage in this context[328]).

The discussion is complex and convoluted, so that a full presentation of it in this context is not possible. Scotus' overall interpretation of Aristotle's notion of (potential) infinite divisibility is reminiscent of that of Albert discussed above, since it also ultimately turns onto the idea of logically incompossible propositions. Still, Scotus' discussion is far more detailed than Albert's synthetic interpretation of *De generatione* I.2 with the tools of modal logic, and it takes into account many issues which are not even raised by Albert.

Scotus' first move is to recall that Aristotle's notion of (potential) infinite divisibility does not entail actual infinite divisibility: "even though it is possible that a continuum is divisible (*dividi*) along any point (*signum*), however, it is not possible that it is divided (*divisum esse*), because this division is in potency and part of a never-ending process (*in potentia et in fieri*)[329], and it can never be all actualised (*in facto esse*)"[330]. Of course, Scotus notes, it is true of *any* point in a continuum that it can be actualised by division, yet it is impossible that *all* the points in a continuum can be actualised together by division, because the actualisation of a point makes it impossible to actualise those "immediately next" to it[331].

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[328] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 319, l. 15-p. 320, l. 3: "Et isto modo debet intelligi responsio Commentatoris super I *De generatione*, qui dicit quod 'facta divisione in uno puncto, prohibetur fieri divisio in alio puncto': non quidem in aliquo determinato (signato vel signabili), sed in aliquo indeterminato."

[329] This expression is the same Scotus uses also in his question commentary on *Categories* 6, as seen above. This is significant, since, as it has been said, the commentary on the *Categories* is one of Scotus' first work, while the *Ordinatio* presents what can be rightly called the most mature stage of his thought. In this case, as in many others, there is a fundamental continuity in Scotus' thought, one which attests to the fact that Scotus, as it was frequent in the Medieval Latin debate, constantly referred to (potential) infinite divisibility as infinite divisibility *in fieri*, whereas correlatively, as this passage shows, he referred to actual infinite division as an infinite division *in facto esse*.

[330] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 311, ll. 13-15: "'licet possibile sit continuum dividi secundum omne signum, non tamen possibile est divisum esse, quia ista divisio est in potentia et in fieri, et numquam potest esse tota in facto esse'."

[331] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 311, l. 16-p. 312, l. 5: "Et tunc ad illas probationes adductas in oppositum, conceditur de quacumque una potentia ad unam factionem, non tamen de infinitis factionibus, cum quarum una reducta ad actum, necessario stat alia non reducta ad actum; sic est in proposito, quia sunt infinitae potentiae ad infinita dividi (cum quarum una reducta ad actum, necessario stat alia non reducta ad actum), et ideo licet concedatur possibilitas ad dividi, non tamen ad divisum esse."

It is at this point, however, that Scotus decidedly shifts to the logical plane of the discussion, as he notes that:

> Against this: it follows, for you, 'a continuum can be divided (*dividi*) along A, therefore it is possible that it is also divided (*divisum esse*) according to A', - and so regarding B and C and any other singular [point] (and this both concerning a determined and an indeterminate point), because there cannot be [in a continuum] any single division which cannot be complete [i.e., actualised]. Therefore all the singular [propositions] of the antecedent entail all the singular [propositions] of the consequent; the antecedent thus entails the consequent: if it can be infinitely divided, then it will be possible that this division is infinitely actualised. That if you say that the singular [propositions] of the consequent are impossible, not however the singular [propositions] of the antecedent, against: from what is possible do not follow incompossibles; but from these singular [propositions; better, from their conjunction] follow those [i.e., incompossible propositions] (it is clear inductively); therefore etc.[332].

The argument is clear: although each of the singular propositions 'if a continuum can be divided along a point A (given that a is a point of a continuum), then the continuum will be divided along A' is true, and, more specifically, they are deductively valid, so that the consequent follows necessarily from the antecedent, this is not so for their conjunction. Indeed, it is not the case that 'if a continuum can be divided along all of its points, then it will be divided along them'. Indeed, all the singular propositions of the above-mentioned kind are possible, not, however, compossible: for any point A, indeed, division at such a point makes it impossible to divide the same continuum at the two points "immediately next" to A, call them B and C, since (as already seen in the second section of this chapter) a point can only exist as a limit of a line, to which it must therefore be conjoined when existing in act.

After this first analysis, however, Scotus discusses (and rejects) three possible alternative logical explanations of the proposition *possibile est continuum dividi*

[332] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 312, l. 13-p. 313, l. 7: "Contra istud: sequitur per te 'continuum posse dividi secundum a, igitur possibile est ipsum esse divisum secundum a',- et ita de b et c et quocumque alio singulari (et hoc determinato vel indeterminato), quia nulla una divisio potest esse quae non potest esse completa. Ergo omnes singulares antecedentis inferunt omnes singulares consequentis; antecedens ergo infert consequens: si potest in infinitum dividi, igitur possibile erit divisionem istam esse factam in actu in infinita. Quod si dicas singularia consequentis repugnare, non autem singularia antecedentis, - contra: ex possibili non sequuntur incompossibilia; sed ex singularibus istis sequuntur illa (patet inductive); igitur etc." Here, as before, I employ capital letters for points, contrary to the convention adopted in the Vatican edition.

secundum quodlibet signum[333]. After this discussion, Scotus restates, in even clearer terms, his position, according to which the proposition that a continuum can be divided along any of its points is true for every singular point of a given continuum (even for an indeterminate one), yet extending the application of this proposition to more than one point together does not entail the extension of its truth value. The ultimate reason, for Scotus, is rightly dependent upon the definition of point, which is the limit of a given continuum, so that the point which is "immediately next" to that first point cannot be actualised together with it[334]. Even if this is so, and it is to be remarked that Scotus is probably the first author to make this statement in such clear terms, Scotus thinks that a further explanation is due concerning the fact that the truth of all singular modal propositions concerning the (potential) infinite divisibility of each point of a continuum does not entail the truth of the conjunction of such propositions:

> But if you argue that any singular [proposition] is true, therefore also the universal [proposition, i.e., the conjunction of all the singular ones], - it can be said that the singular [propositions] are true, not, however, compossible, and all of them are required for the possibility of [the truth of] the universal [proposition]. Against: it is true together that 'a continuum can be divided along A and along B and C', and so of any other singular [proposition] together. I reply. I say that singular propositions concerning possibility (*de possibili*), taken in an absolute way, do not entail, formally, the universal [proposition, i.e., their conjunction] regarding possibility (*de possibili*), but [this] is a fallacy of the figure of speech 'from a series of determinate [propositions], to one [determinate proposition]'[335]. Indeed, singular [propositions]

[333] The first possibility relies on a distinction between a "compositional (*secundum compositionem*)" sense of the proposition, according to which it attibutes (potential) infinite divisibility to any point of a continuum, and a "divisional (*secundum divisionem*)" sense of the same proposition, according to which it attributes (potential) infinite divisibility to every point of the continuum (together). The second distinguishes between two different ways of interpreting the indefinite adjective 'all' (*quodcumque*, or, better, *quaecumque*), a first way, *distributive* (Scotus has *divisive*), according to which it applies to all the members of the collectivity envisaged, and a second way, *collective*, in which it applies to all of them taken in conjunction. A third possibility is to distinguish between a notion of 'possible' applying before the division has taken place and after it has taken place. None of these solutions (the first two are especially influenced by Peter of Spain's *Summulae logicales*) is accepted by Scotus.

[334] That this is the correct interpretation of the reason given by Scotus for the incompossibility implied by the (potential) infinite divisibility of magnitudes appears clearly in the following passage: "Ita in proposito est, quod notatur 'dividi' uniri continuo secundum signum, et pro quolibet eius, - et hoc pro aliquo 'nunc' indeterminato. Hoc autem est impossibile, quia quandocumque unitur sibi praedicatum pro aliquo vel aliquibus singularibus, necessario repugnat sibi pro aliis; necesse est enim – sicut dicit prima responsio – quod cum reductione potentiae (non tantum ad factum esse, sed ad fieri) stet alia potentia, non reducta nec ad actum facti esse nec etiam ad fieri, quia necesse est divisione exsistente 'in fieri vel facto esse' secundum a, aliquod continuum terminari per a, - et ita potentiam quae est in illa parte continui, non reduci ad actum" (IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 315, ll. 10-20).

[335] This fallacy is best illustrated by Peter of Spain in his *Summulae logicales*. See below the discussion of the fallacy in the main body of the text and the original formulation of it in Peter of Spain's *Summulae logicales*.

> can, on the strength of the meaning, join a predicate to a subject according to a certain 'now' [be that determinate or indeterminate], a universal [proposition] instead joins a predicate to a subject for any of them universally; and therefore it derives from the way of meaning 'from many determinate [propositions], to one [determinate proposition]'. This is the reason why from a premiss possible for some 'now' and possible for another 'now', it does not follow the conclusion concerning the universal possibility as now, because those premisses do not mean – due to their form – to join the extremes to the middle; and therefore it does not follow the union of the extremes with each other, and it is not even possible for some of them[336].

In this passage Scotus presents the gist of his logical argument against the claim that that the truth of all singular modal propositions concerning the (potential) infinite divisibility of each point of a continuum does not entail the truth of the conjunction of such propositions. Assuming that the truth of the set of all the singular modal propositions concerning the possibility of the division of each point of a continuum entails the truth of their conjunction (the possibility of the division of every point of a continuum together) is a fallacy, and, more specifically, a fallacy of *suppositio*. Indeed, as explained by Peter of Spain, on whose *Summulae logicales* Scotus likely relies here, the expression *secundum quodlibet punctum* does not have the same *suppositio* (roughly, it does not refer to the same entities) in the singular propositions concerned and in their conjunction. In the former case, *secundum quodlibet punctum* refers to a single point, albeit an indeterminate one (what is captured by translating it as 'along *any* point of a continuum'). In the latter case, instead, *secundum quodlibet punctum* refers to all the points of a continuum (what is captured by translating it as 'along every point of a continuum')[337].

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[336] IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 315, l. 21-p. 317, l. 3 "Sed si arguas quod quaelibet singularis est vera, ergo et universalis, - posset dici quod singulares sunt verae, non tamen compossibilies, et utrumque ad possibilitatem universalis requiritur. Contra: simul est haec vera 'continuum potest dividi secundum a et secundum b et c', et sic de quolibet alio singulari simul. Respondeo. Dico quod singulares propositiones de possibili, absolute sumptae, non inferunt formaliter universalem de possibili, sed est fallacia figurae dictionis 'a pluribus determinatis, ad unum'. Possunt enim singulares ex vi significationis unire praedicatum subiecto pro aliquo 'nunc', universalis autem unit praedicatum subiecto pro quolibet eius universaliter; et ideo proceditur ex forma significandi 'a pluribus determinatis, ad unum'. Ista est ratio quare de praemissa possibili pro aliquo 'nunc' et possibili pro alio 'nunc', non sequitur conclusio de universali possibili ut nunc, quia praemissae illae non significant – ex forma sua – extrema uniri medio; et ideo non sequitur unio extremorum inter se, nec etiam possibilis est pro aliquo eodem."

[337] Cf., especially, PETRUS HISPANUS, *Summulae logicales*, tract. 7, n. 37: "Tertius modus (of the fallacies of the figure of speech) provenit ex diverso modo supponendi, ut [...] 'animal est Socrates, animal est Plato, et sic de singulis; ergo animal est omnis homo'; fit enim processus a pluribus determinatis suppositionibus ad unam determinatam. Et iste tertius modus solet appellari univocus, quia iste terminus 'animal' aequaliter se habet et univoce ad omnia ista supposita. Unde cum in qualibet praemissarum supponat pro uno, in conclusione pro diversis, variatur eius suppositio" (PETER OF SPAIN, Tractatus *Called Afterwards* Summulae Logicales. *First critical edition from the Manuscripts with an Introduction by* L.M. DE RIJK, Assen, Van Gorcum, 1972, p. 37).

Scotus goes on to argue with extreme precision against possible objections to his view, objections which, however, have a very limited bearing on the issues discussed in this chapter and that can therefore be reasonably disregarded here. Instead, it is important to underline that, towards the end of his discussion, Scotus goes on to argue that the incompossibility implied by the notion of the (potential) infinite divisibility, of continua, although ultimately stemming from the impossibility of dividing a continuum at two points "immediately next" to each other, still can also be expressed in a more general form. Indeed, once it is agreed that the division of a continuum can only be a finite process, the incompossibility it implies can be expressed as the falsity of the conjunction between any singular determined modal proposition concerning the possibility of dividing a continuum x at a given point A, and the infinite number of indeterminate modal proposition concerning the possibility of dividing it at each of its other points[338].

After this in-depth discussion of the logical incompossibility implied by the notion of (potential) infinite divisibility, Scotus inserts a further section dedicated to the discussion of the nature of points, as unextended geometrical entities, so as to show from another point of view that they cannot compose a continuum as parts of it. The section is, evidently, especially concerned with the problem of indivisible parts of motion (and instants of time), rather than with indivisible parts of magnitudes, since it seems much easier to claim that indivisibles play a mereological role in the composition of the continuum represented by motion and time, than it is in the case of magnitudes. I cannot enter into the details of Scotus' discussion on the issue, which would lead me astray from the main purpose of the chapter. Still, this section is highly relevant here for what it has to say about Scotus' conception of points, especially in connection with Albert's peculiar remarks on the issue.

The first thing to notice is that Scotus defines (unextended) indivisibles negatively as "[…] lack of a continuum, so that an instant is nothing formally if not the lack of a continuous succession, - and so a point is the lack of length and it does not imply anything

[338] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 318, ll. 14-20: "respondeo: dico quod cuilibet singulari acceptae vel acceptabili, nulla singularis determinate accepta vel acceptabilis repugnat indeterminata compositione pro eodem 'nunc', nec repugnant; tamen cuicumque acceptae repugnant infinitae indeterminatae, - et huius ratio repugnantiae assignata est prius, realis, ex incompossibilitate reductionis omnium potentiarum simul ad actum."

positive"[339]. Scotus is aware of the fact that this definition presents a series of problems (not the least of them, the passage from the *Posterior Analytics*, I.4, 73a34-37, where Aristotle claims that points fall within the *ratio essentialis* of lines, and that, therefore, they are parts of its definition[340]). Moreover, Scotus remarks that if points were merely conceived as a privation (*privatio*) of being, without any positive characterisation, then the same should apply to lines (as privation of breadth and depth) and to surfaces (as privation of depth)[341].

How, then, should one account for the nature of points? Scotus' solution is, on this issue, clear-cut, and I think that here, as in the passage from the commentary on the *Categories* illustrated above, he might have as a target those commentators, such as Albert, who, under the influence of the geometrical tradition, tried to characterise points as the ultimate constituents of lines. According to Scotus, a line has a certain ontological characterisation in its component parts (which are lines) and a different ontological characterisation in its limits, or extremities (which are points). Yet, insofar as points are actualised by the division of a line, they do have a positive ontological characterisation, although they can never be said to be a part of a line[342]. It is not, therefore, the definition of points as lack of continuity which is to be revised, rather its ontological implications: being the extremity of a continuum, a point is, formally, a lack of continuity, but it is the lack of continuity which positively ends a continuum. In the case of motion and time, analogously, indivisibles cannot be said to be part of motions and times, rather, they are only the limits of specific motions and times[343]. As I will show below, the discussion on

[339] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 321, ll. 9-11: "[...] carentia continui, ita quod nihil formaliter est instans nisi carentia successionis continaue, - et ita punctus est carentia longitudinis et nihil positivum dicit'."

[340] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 323, ll. 3-6: "Praetera, secundum Philosophum I *Posteriorum* ratio lineae est ex punctis, - hoc est, in ratione essentiali lineae cadit punctus, qui dicitur de linea primo modo dicendi per se; nulla autem privatio pertinet per se ad rationem alicuius positivi; ergo etc."

[341] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 323, ll. 7-10: "Ex eodem etiam sequitur quod si punctus tantum est privatio, quod etiam linea tantum erit privatio, - et superficies et corpus; semper enim terminatum definitur per teminans, et positivum non includit essentialiter privationem."

[342] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 324, l. 21-p. 325, l. 5: "respondeo: sicut linea non habet uniformiter esse ubique prout 'ubique' distirbuit pro partibus lineae et indivisibilibus lineae (quia in istis habet esse ut in partibus et in illis ut in ultimis), et tamen ubique est uniformiter secundum quod 'ubique' distribuit praecise pro istis vel praecise pro illis, - ita est in proposito."

[343] This also allows Scotus to provide a solution to the formal characterisation of motion which, while retaining Albert's basic idea that motion is a *fluxus formae*, is not committed in any way to affirming that the flowing form from which motion originates is an indivisible one, since such an indivisible could never be part of motion: "Respondeo ad argumentum, quod eo cedente succedit pas continua fluens, et non

the ontology of points (as unextended geometrical entities) will have an important posterity in the early 14th-century.

This section ends Scotus' discussion concerning the composition of continua either out of unextended or of extended (geometrical) indivisibles in the *Ordinatio*. Many other passages of Scotus' writings could be quoted in this context to support the interpretation provided by looking at the young commentary on the *Categories* and the mature reflection contained in the *Ordinatio*. Yet, they would only contribute to reinforce what has already appeared with evidence: Scotus is thoroughly committed to a strict interpretation of the notion of Aristotelian continuum as implying (potential) infinite divisibility, and to the interpretation of such (potential) infinite divisibility in terms of logical *incompossibilia*. In itself, this is nothing more than an orthodox interpretation of Aristotle. Nevertheless, the power, depth and originality of the arguments employed by Scotus, especially in the *Ordinatio*, against the composition of continua out of indivisibles is such that they became the (proximate or ultimate) reference point of almost all subsequent discussions of the issue in the 14th-century Latin tradition.

1.5.4. John Buridan

Before concluding the chapter, it is time to look at John Buridan's discussion of the continuity of magnitudes and of their (potential) infinite divisibility. John Buridan (ca. 1300-ca. 1361), one of the longest serving and more influential master of Arts at Paris in the 14th century, wrote commentaries on Aristotle's *Categories*[344], on the

indivisibile; nec aliquid immediate, nisi sicut continuum est immediatum indivisibili" (IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 324, ll. 15-17).

[344] The commentary has been critically edited as IOANNES BURIDANUS, *Quaestiones in praedicamenta (Veröffentlichungen der Kommission für die Herausgabe ungedruckter Texte aus der mittelalterlichen Geisteswelt 11)*, ed. J. SCHNEIDER, München, Bayerische Akademie der Wissenschaften, 1983. As for many other Aristotelian commentaries by Buridan, also a shorter version of this commentary is extant (in seven manuscripts), which probably reflects a syllogistic systematisation of Buridan's teaching in the style of the new Faculties of Arts which were developing in central and eastern Europe (in this case, especially in Prague) thanks to the teaching of Buridan's pupils. For a comprehensive survey of the textual tradition of Buridan's works, still useful is B. MICHAEL, *Johannes Buridanus. Studien zu seinem Leben, seinen Werken und zur Rezeption seiner Theorien im Europa des späten Mittelalters (2 vols.)*, Ph.D. thesis, Berlin, Freie Universität Berlin, 1985 (esp. Vol. 2).

Metaphysics[345], the *Physics*[346] and the *De generatione*[347], and therefore he represents another thinker for whom it is possible to reconstruct an interconnected interpretation of the notion of the continuity of magnitudes and of their (potential) infinite divisibility. Moreover, given that Buridan is also a key witness (and frequently a key actor) of the new developments taking place in the natural philosophy of the first half of the 14th century, a discussion of his theory of the continuity of magnitudes and of their (potential) infinite divisibility also allows to put into focus some of these new developments, insofar as they affect the topics at hand (other, crucial, developments will, instead, be discussed

[345] There seem to be at least four versions (but likely even more) of Buridan's commentaries on the *Metaphysics*. Two of them preserve his *Expositio in duodecim libros metaphysicorum Aristotelis*, and they are extant only in manuscript form. Of the two versions of the *Quaestiones in duodecim libros metaphysicorum Aristotelis*, the earlier one is preserved in only one manuscript, and it is incomplete (ending in Book ϑ). The later one, which represents Buridan's *ultima lectura* on the *Metaphysics*, is the one which is preserved not only in manuscript form, but also in a 16th-century printed edition, and it represents the last (and most detailed) Buridanian discussion on the *Metaphysics*: IOANNES BURIDANUS, *In Metaphysicen Aristotelis quaestiones argutissimae Magistri Ioannis Buridani in ultima praelectione ab ipso recognite [...]*, Parisiis, apud Iodocum Badium, 1518. For the complex history of Buridan's commentaries on the *Metaphysics*, and for a presentation of the present state of research, see at esp. F.J. KOK, *John Buridan's Commentary on the* Metaphysics, in GALLUZZO, AMERINI (eds.), *A Companion to the Latin Medieval Commentaries on Aristotle's* Metaphysics, *op. cit.*, pp. 495-549. The commentaries will not be discussed in this chapter, however, as they do not add any element of relevance to Buridan's analysis of the notions of the continuity of magnitudes and of their (potential) infinite divisibility.

[346] Also for what concerns the *Physics*, there are at least four versions of Buridan's commentary. Two of them, extant only in manuscript form, contain his *Expositio* (although it has been recently put into doubt whether they really amount to two different versions), while two of them contain his *Quaestiones* on the *Physics*. Of them, one is preserved only in six manuscripts, while the other (the so-called *ultima lectura*) is extant in 32 manuscripts and in various printed editions, of which the *editio princeps* (to which I will refer in this chapter) is IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Parisiis, apud Dionisium Rocem, 1509. A critical edition of Books I-II of the *ultima lectura* has been edited as JOHN BURIDAN, *Quaestiones super octo libros Physicorum Aristotelis (secundum ultimam lecturam). Libri I-II (History of Science and Medicine Library Vol. 50; Medieval and Early Modern Science Vol. 25)*, ed. M. STREIJGER, P.J.J.M. BAKKER, introduction by J.M.M.H. THIJSSEN, guide to the text by E.D. SYLLA, Leiden, Brill, 2015. Previously, the set of Buridan's questions concerning the infinite in his commentary on Book III had been edited as IOANNES BURIDANUS, *John Buridan's* Tractatus de infinito. Quaestiones super libros Physicorum secundum ultimam lecturam, Liber III, quaestiones 14-19 *(Artistarum Supplementa 6)*, ed. J.M.M.H. THIJSSEN, Nijmegen, Ingenium, 1991. The introduction contains important information concerning the textual tradition of Buridan's *Physics* commentaries (see pp. XIII-XLII). Recently, the edition of the questions on Books III and IV has been published as JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis (secundum ultimam lecturam). Libri III-IV (Medieval and Early Modern Philosophy and Science 27)*, ed. M. STREIJGER, P.J.J.M. BAKKER, with a guide to the text by E.D. SYLLA, Leiden, Brill, 2016). For some more details on the different versions of Buridan's *Physics* commentaries, see also Chapter 2.

[347] Even for the *De generatione*, both an *Expositio* and a question commentary are attributed to Buridan. The *Expositio*, however, has been preserved only in two manuscripts, reporting the same version. The *Quaestiones super libros De generatione et corruptione*, instead, are preserved in two different versions. A first one is extant only in three manuscripts, while the other is preserved in 14 manuscripts. A critical edition of the latter version of the *Quaestiones* has been published as JOHN BURIDAN, *Quaestiones super libros* De generatione et corruptione *Aristotelis. A Critical Edition with an Introduction (History of Science and Medicine Library 17; Medieval and Early Modern Science 14)*, ed. M. STREIJGER, P.J.J.M. BAKKER, J.M.M.H. THIJSSEN, Leiden, Brill, 2010.

in the following chapters, insofar as they feature rather prominently in "mature" 14th-century discussions of hylomorphic *minima*).

A few remarks are therefore in order to underline what are these developments. Interestingly, two aspects that are usually considered as an "innovation" of 14th-century discussions, i.e., the use of mathematical arguments in natural philosophy and also the discussions of topics of natural philosophy in terms of propositional analysis, are not innovative at all in the case of the discussion of the continuity of magnitudes and of their (potential) infinite divisibility. On the contrary, they are already present, *in nuce*, as early as in Albert the Great's commentaries, and they feature prominently in John Duns Scotus' discussion in the *Ordinatio*. True, Buridan makes little use of mathematical (in this case specifically geometrical) arguments in his discussion of the continuity of magnitudes and of their (potential) infinite divisibility, due to his view concerning the clear epistemological separation between the two disciplines[348]. Nevertheless, the very fact that he deems it necessary to make reference to geometrical arguments in his discussion of the continuity of magnitudes (differently from what he does in so many other cases in natural philosophy), if anything, provides additional evidence of how closely intertwined geometrical arguments had become with the debate concerning the continuity of magnitudes in the "mature" 14th century. On the contrary, Buridan provides probably the most refined example of a propositional analysis of the notion of (potential) infinite divisibility among those seen in this chapter, understanding and interpreting it according to the general principles of his own semantic theory, but, remarkably, also remaining ultimately faithful to the original intuition in this respect already found in Albert and prominently developed by Scotus. Other typicla 14th-century aspects contribute to give to Buridan's discussion of the continuity of magnitudes and of their (potential) infinite divisibility. Among them, it is especially important to mention one of them, that (differently from the two already mentioned) will also play an important role in Buridan's discussion of hylomorphic *minima*. This is Buridan's insistence on providing examples from everyday experience. Although this might seem to represent only a marginal feature of Buridan's discussion, I will show throughout the thesis that it contributes significantly to shape Buridan's understanding of the views at issue.

[348] Cf. the references below, n. 358.

After this general discussion, it is now possible to look in detail at Buridan's views concerning the continuity of magnitudes and their (potential) infinite divisibility. Buridan's question commentary on the *Physics* presents a series of interesting features concerning the topic of the continuity of magnitudes. The first is that, in his commentary on Book V, Buridan does not devote any question to the discussion of chapter 3, and therefore also to the definition of continuity, devoting almost all of his attention in the commentary on this Book to the study of motion. Now, while this might be an idiosyncrasy of Buridan[349], it is also highly indicative of the fact that, by the mid-14th century, the notion of continuity was understood more and more as being tied to the discussion of (potential) infinite divisibility in Book VI, while the discussion of *Physics* V.3 was not perceived as adding anything substantial to it.

Buridan, instead, provides a very extended discussion of the notion of points, in relation to continuous magnitudes, in the first four questions on Book VI. A premiss is, however, in order. Indeed, a correct understanding of this discussion presupposes a brief presentation of Buridan's reflection on the ontology of points within situated in its larger historical context, something which is now possible to do, in most of its details, especially thanks to Jean Celeyrette's pioneering studies, on which I rely in what follows[350]. Indeed, in q. 63 of his *Quaestiones in libros Physicorum*, William of Ockham had argued that 'point' is only a privative name, which could understood in two ways. In the first way, a point can be said to supposit for something, but it is nothing more than a connotative

[349] Although I am inclined to consider it an instance of a more general tendency: John of Jandun, for instance, does not devote any question to *Physics* V.3 in his commentary. Even the 14th-century commentators who discuss the issue of continuity in the commentary on Book V of the *Physics*, do so only insofar as they want to discuss issues which are far from the original Aristotelian text. In John the Canon, for instance, the issue of continuity crops up rather casually only in two questions on *Physics* V, the former concerning the intension and remission of accidental forms (Liber V, q. 3, *Utrum in quidditate formae accidentalis sit dare generandus secundum quos ipsa possit suscipere magis et minus, et secundum quod possit motum terminare*) and another concerning the endpoint of motion (Liber V, q. 6, *Utrum ubi sit per se terminus motus localis*). This does not mean, in any case, that the traditional definition of continuity given by Aristotle in *Physics* V.3 had been forgotten. Buridan himself, in the first *quaestio* on *Physics* VI, notes, in reference to the concept of line, that "[...] linea ubique sui preter quam in puncto extremo habet partes ad invicem continuas et per consequens copulatas ad terminum communem quod est punctum [...]" (IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Liber VI, q. 1, Parisiis 1509, f. 23vb).

[350] Cf. especially J. CELEYRETTE, "La problématique du point chez Jean Buridan", *Vivarium* 42 (1), 2004, pp. 86-108, ID., *An Indivisibilist Argumentation at Paris around 1335: Michel of Montecalerio's Question on Point and the Controversy with John Buridan*, in GRELLARD, ROBERT (eds.), *Atomism in Late Medieval Philosophy and Theology*, *op. cit.*, pp. 163-182, and also J. CELEYRETTE, "The *Quaestio de Puncto* by Michel de Montecalerio in Response to Jean Buridan", *Archives d'Histoire Doctrinale et Littéraire du Moyen Âge* 75 (1), 2008, pp. 369-449.

name which expresses the negation of something. More specifically, a point supposits for a line by connoting the abence of continuity between its parts (for a *punctum continuans*) or the absence of length beyond it (for a *punctum terminans*). In the second way, the name 'point' stands for a proposition. For instance, a *punctum terminans* stands for the proposition *tantum protenditur linea et non ultra*.

We know that Buridan shared the idea that 'point' is only a privative name (and he even radicalised it) in a *quaestio* specifically devoted to it, which has been published edited in 1961 by Vassili Zubov[351]. The *quaestio* was part, as we now know, of a larger debate, which presumably took place in the late 1330s or early 1340s, between Buridan himself and another Parisian Master of Arts at the beginning of the 1340s known as Michel de Montecalerio[352]. We do not possess the original text in which Montecalerio attacked Buridan (together with other masters allegedly sharing his position), and to which Buridan was responding in the *quaestio* edited by Zubov. We do, however, possess a text in which Montecalerio replied to the *quaestio* by Buridan[353]. In Buridan's *quaestio*, the name 'point' is taken to be a privative name such as 'blindness'. In particular, 'point' means the absence of divisibility or extension in a magnitude. Buridan, adopting a distinction that was becoming increasing prominent in the 14th-century debate on the composition of the continuum, considers both the case of points conceived of as the extremities of a line (*puncta terminantia*) and that of points conceived of as situated between the parts of a given line (*puncta continuantia*). For a *punctum continuans*, the absence of extension between two parts of a line continuous with each other, and for a *punctum terminans* the absence of extension beyond it[354]. This, of course, poses a problem

[351] Cf. V. ZUBOV, "Jean Buridan et les concepts du point au XIVe siècle", *Medieval and Renaissance Studies* 5, 1961, pp. 63-95. Zubov's edition is based on ms. Paris, BnF, Lat. 16621, ff. 196r-202v and 203v, and Paris, BnF, Lat. 2831, ff. 123r-129v.

[352] The identity of Michel de Montecalerio has been determined by William Courtenay (cf. W.J. COURTENAY, "The University of Paris at the Time of Jean Buridan and Nicole Oresme", *Vivarium* 42 (1), 2004, pp. 3-17, esp. pp. 8-10, and ID., "Michael de Montecalerio: Buridan's Opponent in His *Quaestio de puncto*", *Archives d'Histoire Doctrinale et Littéraire du Moyen Âge* 72, 2005, pp. 323-331.

[353] The text, preserved in one of the manuscripts containing Buridan's corresponding *quaestio*, the ms. Paris, BnF, Lat. 16621, ff. 214r-223v, has been edited in CELEYRETTE, "La *Quaestio de puncto* de Michel de Montecalerio en réponse à Jean Buridan", *op. cit.*

[354] Cf. ZUBOV, "Jean Buridan et les concepts du point au XIVe siècle", *op. cit.*, p. 86: "Ad evidentiam solutionis istarum omnium questionum sciendum quod hoc nomen punctum est nomen privativum, sicut cecitas. Nam sicut cecitas significat carentiam visus in oculo, ita punctum significat carentiam divisibilitatis seu extensionis in magnitudine, et similiter instans carentiam successionis in tempore" (quoted in CELEYRETTE, "La problématique du point chez Jean Buridan", *op. cit.*, p. 90, n. 20).

concerning the truth value of propositions which have 'point' as a subject, but the way in which Buridan solves the difficulty needs not concern us here.

What is important to underline is that the position concerning the ontology of points adopted by Buridan in his early *quaestio* is abandoned in the (presumably) later commentary on the *Physics de tertia lectura*. There, Buridan clearly distinguishes between two conceptions of point, none of which corresponds to the one of the earlier *quaestio*. The first one, which he explicitly says is the one adopted by mathematicians, is the conception according to which a point is an (unextended) indivisible which it is imagined to exist either at the extremity of a line or within it. The name 'point', therefore, means the same as 'indivisible entity having a position at the end of/within a line'. The important aspect to underline here is that Buridan, however, denies that points, understood in this sense, have any reality apart from the one they have in mathematical (specifically geometrical) imagination, as part of a hypothetical reasoning.

Still, the conception which Buridan evidently takes to be relevant to natural philosophy is the second one. Buridan starts presenting it by claiming, as in the earlier *quaestio*, that 'point' is a privative name, meaning the absence of divisibility. Nevertheless, Buridan immediately afterwards abandons the conception of the earlier *quaestio* by claiming that the negation implied by the meaning of 'point' can be understood in two ways. Firstly, the negation can be understood in an absolute way (*absolute*). In this case, however, points would not exist altogether. According to Buridan, instead, the negation is to be understood in a second way, that is, *secundum quid*. Although Buridan's explanation is not devoid of obscurities, what he claims is that, in this second way, the name 'point' supposits for something in itself (contrary to Ockham), that is, for a divisible part of a line. For instance, in the case of a *punctum terminans*, the name supposits for the first part of a given line which can be considered its beginning. True, point is still a privative term, but not because it does not supposit for something in itself, rather, because it supposits for a given (part of a) magnitude that is considered separately from (in a sense, "in abstraction from") its property of divisibility (*[…] sed dicatur 'punctum' prout intelligitur absolve ab omni tota divisibilitate*). It is clear that this second conception, what could be called the "physical" conception of point, refers to entities that are entirely equivocal with the ones to which the notion of 'point' as adopted throughout this chapter refers. Indeed, the notion of point relevant to Aristotle's discussion in all the

passages analysed above is Buridan's first conception, therefore, the notion of points as (unextended) indivisible entities.

In the commentary on *Physics* VI *de ultima lectura*, both conceptions of point distinguished in the *tertia lectura*, i.e., the "mathematical" and the "physical" one, play a role. Nevertheless, I limit my analysis to Buridan's discussion of the "mathematical" notion of points as indivisibles in the commentary, given that it is the notion to which I have referred throughout the chapter. Such notion is discussed in qq. 1 and 2 of the commentary, whereas the "physical" notion is discussed in qq. 3 and, especially, 4 of the same commentary.

Buridan opens the discussion on *Physics* VI.1, in q. 1, by discussing whether ("mathematical") points, taken not as the extremities (*termini*) of a continuum, but rather as independent entities (*res*), can be said to be contiguous (*proxima*) in a line and, as a consequence, whether they can be said to be between the parts of a line. Evidently, Buridan is focusing specifically on *puncta continuantia*. What is more difficult to ascertain is whether Buridan is considering the (indivisible) points which are the subject of the quaestio as extended or as unextended ones. This distinction is a relevant one, since, as seen above, it already features in Scotus' discussion of the composition of continuous magnitudes. Nevertheless, Buridan does not draw the distinction explicitly. Moreover, throughout q. 1 and q. 2 on Book VI of the *Physics* in the *ultima lectura*, he seems to oscillate between the two notions. Indeed, while most of the arguments he provides are compatible both with unextended and extended geometrical indivisibles (Buridan himself specifies it at times), there is at least an argument (the first one coming from Eudemus' fr. 100 Wehrli and already discussed above), that only applies to extended geometrical indivisibles. While the truth of the matter cannot be determined without an investigation which would go beyond the scope of the thesis, the difficulty to trace a boundary between unextended and extended indivisibles in Buridan's discussion, contrary to what was the case in Scotus, might also represent an instance of the more general 14th-century tendency, already underlined above, to tend to conflate the geometrical and the physical level of the discussion, although, it should not be forgetted, Buridan also works with a further (divisible) notion of "physical" points.

Be that as it may, in q. 1 Buridan, who correctly links the discussion on points presented here with the one in *De generatione* I.2[355], draws as a first conclusion that "mathematical" points could not be contiguous in a line (and *a fortiori* continuous), by distinguishing two hypotheses and arguing, in both cases, according to a *reductio ad absurdum*. The former is that the points (following closely Aristotle's own discussion in *Physics* VI.1), by being *proxima* with each other, would come to "touch" each other whole to whole and would therefore occupy the same position (*essent omnino simul situaliter*)[356].

In this first case, however, Buridan notes the following:

> […] the minor [premiss] is proved: firstly, it is certainly impossible that [points] are totally together and indistinct according to position because they would exist without a purpose (*frustra*), indeed, a thousand [points] existing in this way would not have a greater extension than a single one and [if they would not have a greater extension] then a single one would suffice to produce the same state of things than a thousand ones […][357].

The second hypothesis would be that the points, by being *proxima*, would retain separate positions (and would therefore, presumably, constitute the parts of a line). In this case, however, they should be touching either part to part or part to whole, something which, again, is clearly excluded by Aristotle in *Physics* VI.1. Moreover, in this latter case, a series of absurd consequences would follow. The first of them is, unsurprisingly, Scotus' argument concerning the incommensurability of the side and the diagonal of the square, which Buridan presents as follows:

> Moreover, if two points "immediately next" to each other in a line did not constitute any linear extension they would exist without a purpose, as it was said, and if they constituted a linear extension [i.e., if they retained different positions, by touching either part to part or part to whole] a series of inconvenient consequences would

[355] IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Liber VI, q. 1, Parisiis 1509, f. 24ra: "Oppositum determinat Aristoteles in isto sexto et in primo *De generatione*."

[356] IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Liber VI, q. 1, Parisiis 1509, f. 24ra.

[357] IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Liber VI, q. 1, Parisiis 1509, f. 24ra: "[...] minor probatur: primo quidem impossibile est quod sint simul omnino et indistincta secundumm situm, quia frustra essent, nam mille sic existentia non plus facerent de extensione, tunc ad omnia salvanda sufficeret unum sicut mille [...]."

> follow. For instance, firstly, it would follow that the diagonal (*diameter*) of the square is equal to the side of that square, which is against geometry. The consequence is proved because I posit four points of the square touching each other (let these points be A, B, C, and D), so that one side of that square is [the line] AB, the other BC, the third CD and the fourth DA. Then, therefore, the diagonal is AC and thus, in this way, I ask whether A and C touch each other or whether there is any intermediate point. If they touch each other, then it follows, given that they are indivisible so as A and B, that they do not constitute a greater line than A and B and so the diagonal is equal to the side. If, on the contrary, it is said that between A and C there is an intermediate [point] D, this cannot be smaller than a point and so the diagonal will be a line of three points and the side of two, therefore the diagonal will be commensurable with the side. The opposite of such proposition, however, is demonstrated in geometry[358].

Now, the argument is extremely different from Scotus' version (so much so that they should better be considered two different arguments[359]), and it is based on the assumption

[358] IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Liber VI, q. 1, Parisiis 1509, xxiiiirb: "Item si duo puncta sibi invicem proxima in linea non constituerent aliquam extensionem linealem essent frustra ut dicebatur et si constituerent extensionem linealem sequerentur inconvenientia puta primo sequitur quod diameter quadrati esset equalis coste illius quadrati quod est contra geometriam consequentia probatur quia pono quatuor puncta a b c d ita quod una costa illius quadrati est a b et alia est b c tertia est c d et quarta est d a tunc ergo diameter est a c et tunc igitur ego quero utrum a et c tangunt se vel est aliquid intermedium si tangunt se tunc sequitur cum ita sint indivisibilia sicut a et b quod non constituunt maiorem lineam quam a et b et sic diameter est equalis coste si vero dicatur quod inter a et c est aliquid medium hoc non potest esse minus quam punctum et sic diameter erit linea trium punctorum et latus duorum ideo diameter erit commensurabilis coste cuius oppositum demonstratum est in geometria." As noted by J.M.M.H. THIJSSEN, "Buridan on Mathematics", *Vivarium* 23 (1), 1985, pp. 55-78, which provides a (brief) presentation of this argument in his discussion of Buridan's use of geometrical (and arithmetical) arguments in the context of natural philosophy, this is one of the very few purely geometrical arguments (but not the only one, contrary to what Thijssen claims) that Buridan uses in connection with the issue of the structure of the continuum (although it should always be remembered that the *quaestio* in which it finds its place, such as the ones immediately following it, is concerned with points and lines), and one of the few which find a place in his *Physics* commentary. This is due to Buridan's insistence on the methodological distinction between geometry and natural philosophy (cf. IOANNES BURIDANUS, *Quaestiones in Physicam*, Liber I, q. 5, quoted in THIJSSEN, "Buridan on Mathematics", *op. cit.*, pp. 60-61, n. 19: "Hec ergo declaro, quia magnum dubitabele est et fuit apud antiquos, utrum corpus esset compositum ex punctis indivisibilibus vel non, sed esset divisibile in semper divisibilia. Et illam dubitationem non potest geometer tractare per suam scientiam, sed tractanda est per phisicam vel per metaphisicam, et tamen geometer habet supponere quod continuum non sit compositum ex indivisibilibus, quia si esset compositum ex indivisibilibus, omnes pene conclusiones geometrie essent false"). The fact, therefore, that the argument of the incommensurability of the diagonal and the side of a square finds a place even in the discussion of a master who is notoriously not inclined to the use of geometrical arguments in natural philosophy is noteworthy, as I have already remarked, and it speaks, I believe, unambiguously about the influence exerted by Scotus' discussion against the composition of continua out of indivisibles in 14th-century Paris (and not only). In this respect, THIJSSEN, "Buridan on Mathematics", *op. cit.*, p. 58, n. 12, also notes that this argument (one of the two geometrical ones discussed by Scotus) is used by a number of 14th-century thinkers, such as Gregory of Rimini, in his *Sentences* commentary (Liber II, d. 2, q. 2), Marsilius of Inghen in q. 1 on Book VI of the *Physics*, and Thomas Bradwardine in his *Tractatus de continuo*. It is interesting that, on the contrary, there seems to be no mention of the other geometrical argument discussed by Scotus in this context, neither in Buridan nor in these other thinkers.

[359] While it is more closely reminiscent of Bacon's original formulation.

that two points with different positions can constitute the side of a square (or its diagonal, or any other line, for that matter)[360]. Assuming this, given four points which form a square, with sides AB, BC, CD, and DA, the diagonal is either constituted by two points (AC, or BD) and, in this case, it has the same number of points of the sides, or it is composed by more than two points, imagining that there is at least a third one in-between A and C or B and D. In this latter case, the diagonal is longer than the sides of the square. In both cases, however, the diagonal is commensurable with the sides of the square, and, since this conclusion is in contradiction with Euclidean geometry, the premiss from which it stems (namely, the possibility of points being contiguous while retaining different positions) must be rejected[361]. This is in itself an extremely important conclusion for the present thesis, since it clearly shows, starting from the premisses adopted by Aristotle in *Physics* VI.1 (i.e., the impossibility for unextended indivisibles to touch, if not whole to whole) but proceeding in a rather different way, that two points cannot be either continuous or contiguous with each other. True, the arguments say nothing about two points merely being in succession with each other, but, as shown above, Aristotle himself adopted a different argument in this respect in *Physics* VI.1.

Buridan goes on to present a series of related *conclusiones*, whose most important one, for the purposes of the present chapter, is that "[…] there are no points in a line which are indivisible things"[362], and so, Buridan notes, is also the case for time and motion[363].

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[360] This is a somewhat counterintuitive assumption, at least insofar as it is thought to apply also to unextended indivisibles. Nevertheless, Buridan seems to think (and he will make it explicit in q. 2 on Book VI, cf. *infra*) that if two points are taken to be contiguous, yet retaining separate positions, they (together) occupy a certain extension, which is represented by the distance between their two positions, although, by the very definition of being contiguous, there can be no line between them.

[361] Of course, for Buridan as for Scotus, the argument remains valid for any number of finite points composing the side and the diagonal of the square, while it does not extend to the case of unequal infinities. Buridan explicitly acknowledges the restriction of the validity of the argument to the case of lines composed of finite points in q. 2 on Book VI, as will be shown below.

[362] IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Liber VI, q. 1, Parisiis 1509, f. 24va: "[...] nulla sunt puncta in linea que sunt res indivisibiles."

[363] Here Buridan states his adherence to the 'isomorphism thesis': "Quarta conclusio sequitur quod etiam in tempore non sunt instantia que sint indivisibilis durationis nec etiam in motu momenta que sint indivisibilia, quia similiter oporteret dicere de punctis in linea, de instantibus in tempore et de momentis in motu, sicut etiam postea magis videbitur, et quia etiam oportet similiter dicere de punctis ad lineam, de lineis ad superficies et de superficiebus ad corpus" (IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Liber VI, q. 1, Parisiis 1509, f. 24va). The most interesting aspect of Buridan's statement is certainly that he does not make explicit reference to physical magnitudes, in relation to motion and time, but he rather substitutes it with a reference to geometrical magnitudes. Even more than that, Buridan also states an explicit

After this first *quaestio*, Buridan, in q. 2, turns to the complementary issue of whether lines can be composed of (unextended) indivisible points[364]. Buridan firmly rejects this possibility, thus reaffirming his clear "continuist" stance, which has already been underlined. His argumentative strategy, again, is a *reductio ad absurdum* based on two alternative hypotheses (which focus, again, on the case of *puncta continuantia*). The first hypothesis is that a line could be composed of an infinite number of points. This, however, is impossible, either if the points are taken to have the same position (because then they would exist without a purpose, as proved in the previous *quaestio*) and if they are taken to have separate positions, because then an infinite number of points would compose a line of infinite length, something utterly impossible, going against the Aristotelian denial of the actual infinite[365].

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isomorphism thesis with respect to *puncta* in lines, *momenta* in motion and *instantia* in time. This is a significant signal of the fact that the discussion on the continuity of magnitudes was shifting more and more strongly, in the 14th century, to a discussion of geometrical continua, while, of course, the properties applying essentially to such continua still applied accidentally also to material substances. Cf., in this respect, *ibid*., q. 2, f. 25rb, where the isomorphism thesis is expressed, more traditionally, with a reference to a moving body: "Tertia conclusio ponitur de eo quod nunc supponebatur, ut videlicet quod si linea est composita ex indivisibilibus oportet tempus esse compositum ex indivisibilibus et motum si linea non est composita ex indivisibilibus sed ex semper divisibilibus ita oportet esse de tempore et de motu, et hanc conclusionem Aristoteles evidenter demonstrat, quia, si mobile movetur continue per aliquod spacium quod pertransit in aliquo tempore, necesse est si illud tempus est divisibile quod in parte eius minus de illo spacio pertranseatur quam in toto. Ideo sequitur quod illud spacium est divisibile, et si illud spacium est divisibile necesse est quod pars eius in minori tempore transeatur quam totum; ideo sequitur quod illud tempus est divisibile."

[364] Here Buridan also mentions the same passage from the *Posterior Analytics* according to which the *substantia* of a line comes from points, a passage already mentioned by both Albert and Scotus, but he claims that it (together with an analogous passage from the *Metaphysics*) is to be interpreted in a dialectical way: "[...] dico quod hoc dictum fuit non determinando veritatem sed arguendo disputative ad questionem" (IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Liber VI, q. 2, Parisiis 1509, f. 25va).

[365] Cf. IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Liber VI, q. 2, Parisiis 1509, f. 25vb: "Prima conclusio est quod si puncta essent in linea res indivisibiles, non essent infinita puncta in linea finite, ut in linea pedali. Ista conclusio probatur ex dictis in alia questione, quia oporteret illa puncta esse extra invicem situaliter, aliter frustra ponerentur, ut dictum fuit, et oporteret etiam illa puncta esse ad invicem proxima ut dicebat secunda conclusio prioris questionis; et si sit hoc, ita tunc duo puncta invicem proxima reddunt aliquantam extensionem linealem, aliter non essent extra invicem situaliter. Etiam hoc patet si sumantur tria puncta in directum ordinata que sint a b c; tunc ergo si c est eque propinquum ipsi a sicut b, necesse est quod c et b sint simul secundum situm, quod supponebatur esse falsum, et si c sit remotius ab a quam b vel quod non sit eque propinquum, tunc c distabit ab a et non est distantia sine extensione. Hoc ergo supposito, scilicet quod duo puncta reddunt aliquantam extensionem, cum talia duo reddunt tantam et sic ultra de singulis, ideo si essent infinita puncta tunc essent infinite extensiones non participantes, quarum quelibet esset tanta quanta erat prima data, scilicet constituta ex a et b, sed regula est quod quacumque certa dimensione data quantumcunque parva infinite quarum quelibet esset tanta redderent infinitam extensionem, ideo linea esset infinita et non finita in qua essent infinita puncta." In this passage, as mentioned above, Buridan explains his idea that contiguous unextended points retaining separate positions would "spread over" a certain extension, although not being themselves extended.

The second hypothesis is that a line is composed of a finite number of points. Buridan shows, however, that, by accepting this hypothesis, the absurd conclusion of the commensurability of the diagonal and the side of the square would, once again, follow[366]. More than that, Buridan also shows that this hypothesis would lead to another absurd conclusion. Such conclusion is, significantly, illustrated by Buridan with a geometrical argument that represents a version of the first of the two Eudemian arguments of fr. 100 Wehrli, already encountered multiple times in the course of the present chapter:

> […] it follows as well [from the fact that a line is composed of a finite number of points, each having a separate position from all the others] that a line of five points will be divisible in two halves and in this way the middle point will be divisible, such as it was argued concerning motions one of which was twice faster than the other[367].

Apart from the reference to motion, the argument is clearly reminiscent of the original one, as mediated by Averroes. The argument is, of course, simplified, insofar as it makes reference to one line instead of two (albeit it refers to two motions). Still, its fundamental insight is retained[368]. Of course, together with the insight of the argument, Buridan also retains all of its ambiguities, since the notion of point adopted in the argument, as mentioned above, is necessarily that of an extended entity, albeit an indivisible one. The fact, therefore, that Buridan inserts an argument which limits itself to attack extended indivisibles in a discussion apparently aiming both at unextended and extended ones provides additional support to the view put forth by Christophe Grellard, and already mentioned above, that Eudemus' arguments contributed to create a conceptual confusion between geometrical and physical indivisibles in the 14th-century Latin debate[369].

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366 IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Liber VI, q. 2, Parisiis 1509, f. 25vb: "Secunda conclusio est quod si puncta essent res indivisibiles nulla linea finita componeretur ex punctis, quia non ex punctis infinitis per precedentem conclusionem, nec ex finitis; quod probatur, quia sequerentur inconvenientia dicta in alia questione secundum quod quadrati quattuor punctorum diameter esset equalis vel commensurabilis coste."

367 IOANNES BURIDANUS, *Acutissimi philosophi reverendi Magistri Johannis buridani subtilissme questiones super octo phisicorum libros Aristotelis [...]*, Liber VI, q. 2, Parisiis 1509, f. 25vb: "[...] sequitur etiam quod linea quinque punctorum esset divisibilis in duas medietates et sic medium punctum esset divisibile, sicut arguebatur de motibus quorum unus esset altero velocior in duplo."

368 The presence of the argument in Buridan, but not in the 13th-century thinkers analysed before, seems to be a clear signal of the growing importance of the argument at the beginning of the 14th century, as it can be recognised by considering that it features prominently in the atomistic debates of this same century, as mentioned above.

369 Buridan also inserts, after this argument, another one, based on the comparison between a straight line and a curved one. The argument, however, can be safely disregarded here.

After these first two *quaestiones*, Buridan includes two other *quaestiones* having a bearing on *Physics* VI.1. The first of them deals with the nature of the three dimensions of length, breadth and depth, while the second one is devoted specifically to points, namely, whether points are indivisible entities (*res indivisibiles*) in a line. A discussion of any of these two *quaestiones* in detail would lead us astray from the purpose of the chapter, since, as said, in both questions (and especially in q. 4) Buridan is concerned with the "physical" conception of points presented above.

Buridan's understanding of the notion of the (potential) infinite divisibility of magnitudes is also highly significant for this chapter. Indeed, while Buridan did not deal specifically, in his question commentary *secundum ultimam lecturam* on *De generatione* I.8 (the one analysed in this chapter), on Aristotle's arguments against atomism, his remarks on Aristotle's solution to the "atomistic dilemma" in commenting on *De generatione* I.2 are interesting from various points of view.

Buridan devotes the fifth *quaestio* of his commentary on *De generatione* Book I to the issue *Utrum corpus sit divisibile secundum quodlibet signum eius et secundum quemlibet punctum eius*[370]. In the arguments *quod non*, Buridan first presents the "atomistic dilemma" in a traditional way. When, however, Buridan introduces the argument *quod sic*, instead of mentioning the fact that the (potential) infinite divisibility of magnitudes is maintained by Aristotle *in littera*, he introduces a different train of thoughts, which shows that his main concern in the discussion is represented by material substances, rather than by geometrical entities:

> The opposite is argued because: since a body is homogeneous, there is no reason why division could take place somewhere rather than somewhere else; therefore either it is divisible according to any of its junctures (*signum*), or in none of them;

[370] Buridan makes clear, in this case, that he is not talking of *puncta terminantia*, but rather of *puncta continuantia* ("non loquendo de punctis terminantibus, sed de punctis continuantibus, quia nullus diceret quod linea esset divisibilis super extremum punctum eius", JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 61, ll. 2-4). It should be remembered, in this respect, that, as seen in his *Physics* commentary *secundum ultimam lecturam*, and as reaffirmed here, Buridan rejects the idea of points as (indivisible) components of a line. The *puncti continuativi* or *continuantes*, therefore, are merely the potentially existing ones as common extremities of the parts of a line, which are actualised by the separation, through division, of those same parts ("Nota. Non est cura ad praesens utrum in linea sint puncta indivisibilia in linea (*sic!*), quia si nihil est indivisibile in linea, sicut credo esse verum, ita quod puncta non sunt res indivisibiles, tunc sensus quaestionis erit utrum corpus sit divisibile in omnes eius partes loquendo de divisione per discontinuationem partis de parte per realem separationem", *ibid*., p. 62, ll. 8-13).

> but not in none of them, because it appears that it is divided in reality (*de facto*); thus it is divisible according to any of its junctures[371].

What is striking in this passage, and it is a feature that Buridan will maintain throughout his discussion of the issue, is the reference to the fact that it is possible to know that a body (intended as a material substance) can be divided because it is *de facto* divided, that is, because we can learn it from everyday experience. This reference to everyday experience, as mentioned above, shows that Buridan, consistently with an overall methodological feature of his natural philosophy[372], prefers to use, in the discussion of the continuity and (potential) infinite divisibility of magnitudes in the commentary on the *De generatione* I.2, arguments coming from experience rather than from geometrical considerations (rather differently, in this respect, from what is true of his first questions on *Physics* VI).

At this point, before starting to determine the solution to the *quaestio*, Buridan adds an important note concerning the fact that this issue bears more on logic than on natural philosophy, insofar as it concerns propositions of the kind of "once something possible has been posited in existence, nothing impossible follows" (*possibili posito in esse nihil sequitur impossibile*)[373].

This is a remarkable element: after Scotus (but, as it has been noted above, Scotus' own discussion has important precedents in the 13th century, such as Albert the Great), the notion of (potential) infinite divisibility of the continuum is systematically interpreted

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[371] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 62, ll. 3-7: "Oppositum arguitur quia: cum corpus sit homogeneum, non est ratio quare possit alicubi ipsius divisio magis esse quam alibi; igitur vel est divisibile secundum quodlibet signum sui vel secundum nullum; sed non secundum nullum, quia apparet quod de facto dividitur; igitur secundum quodlibet signum sui est divisibile."

[372] On the role of *experientia* and *experimentum* in Buridan's natural philosophy, see especially Z.V. TÓTH, *Buridan's Physics and/or Experimental Method: The Concept and Role of Experimentum in John Buridan's* Physics *Commentary*, Budapest, VDM Verlag, 2010.

[373] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 62, ll. 14-16: "Nota quod difficultas illius quaestionis est principaliter ex logica, quia non est bene notum quomodo illud principium logicum debet intelligi, scilicet 'possibili posito in esse nihil sequitur impossibile'." An analogous logical treatment of the (potential) infinite divisibility of magnitudes is presented by Buridan in his commentary *de ultima lectura* on *Physics* III.4-8. For an analysis of that discussion, one which largely agrees with the interpretation I provide here of Buridan's treatment of the same issue in the commentary *de ultima lectura* on *De generatione* I.2, see J.M.M.H. THIJSSEN, J.E. MURDOCH, *John Buridan on Infinity*, in J.M.M.H. THIJSSEN, J. ZUPKO (eds.), *The Metaphysics and Natural Philosophy of John Buridan (Medieval and Early Modern Philosophy and Science 2)*, Leiden, Brill, 2001, pp. 127-149, esp. pp. 134-140.

as really being a question of modal logic[374]. Before getting to his own solution of the logical issues involved, however, Buridan recalls how the issue is traditionally interpreted by commentators, according to two conclusions[375]. The first is that a body (a material substance), as here Buridan explicitly acknowledges, is divisible at any of its points:

> I say therefore that a body is divisible according to any of its junctures or any of its points, if points are posited in a line such as the mathematicians imagine. And because points are not such, thus I state the conclusion in other words, that is, that a body is divisible in any of its parts having a position outside that of the others. It is proved by induction because: in those two it is divisible, and in those three, and in those hundred, and so of all the others without interruption; thus it is divisible in all [of its parts][376].

The passage is especially relevant in that it underlines, once more, two elements already emerged in Buridan's analysis of continuity and (potential) infinite divisibility in the *Physics* commentary *de ultima lectura*. Firstly, Buridan insists on the fact that "mathematical" (indivisible) points do not exist if not as a fiction of mathematicians. Nevertheless, it is extremely significant that Buridan does not claim that, as a consequence, the issue of the (potential) infinite divisibility of "enmattered" magnitudes

[374] It should be remembered, however, that, as seen above, in Scotus' analysis it is still quite clear (and in Albert it was even clearer) that, while the issue of (potential) infinite divisibility of continua poses logical difficulties which need to be solved, the ultimate solution to the question is given thanks to the definition of points as the extremities of continua, and to the ensuing ontological and conceptual impossibility to actualise together two points "immediately next" to each other. In Buridan, however, logical analysis takes decidedly precedence over the ontological-conceptual solution to the issue, so that Scotus' analysis represents the most likely turning point from the (prevalent) conceptual-ontological solution to the (prevalent) logical one. That this is so, it can also be inferred from a consideration of the fact that most commentaries of the second half of the 13th century (such as Aquinas, but not only) still tend to analyse the issue at the conceptual-ontological level. This is paradigmatically so, for instance, in Boethius of Dacia's commentary on the *De generatione*: "Ad istam quaestionem dico quod corpus non potest simul dividi secundum quodlibet punctum, quia omne punctum in quo potest linea dividi, ipsum debet esse in medietate duarum linearum. […]. Si ergo haec propositio vera, et omne punctum in quo debeat linea dividi debet esse medium duarum linearum, et divisa linea punctum terminans unam partem et punctum terminans alteram partem non est medium duarum linearum, ideo quando dividitur linea in uno puncto, amittit potentia dividendi in alio puncto" (BOETHIUS DE DACIA, *Quaestiones de generatione et corruptione (Boethii Daci Opera vol. V, Pars I)*, ed. G. SAJÓ, København, GEC GAD, 1972, Liber I, q. 17, p. 35, l. 21-p. 36, l. 34).

[375] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 62, ll. 17-18: "Et primo pono conclusiones quas communiter omnes concedunt et quae secundum veritatem sunt concedendae."

[376] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 62, l. 19-p. 63, l. 1: "Dico igitur quod corpus secundum quodlibet signum sui sive secundum quodlibet punctum sui est divisibile, si ponantur puncta in linea sicut mathematici imaginantur. Et quia non sunt talia puncta, ideo pono conclusionem in aliis verbis, scilicet quod corpus in omnes eius partes habentes situm extra invicem est divisibile. Probatur per inductionem quia: in illas duas est divisibiles, et in illas tres, et in illas centum, et sic de omnibus aliis sine statu; ideo in omnes est divisibile."

is to be discussed according to the "physical" (divisible) points analysed by Buridan especially in q. VI.4 of the *ultima lectura* on the *Physics*. Quite on the contrary, Buridan refers to the notion of 'position' (*situs*), a concept, as seen above, already used in qq. VI.1-2 of the *ultima lectura* on the *Physics*, to identify a sort of "physical functional equivalent" of "mathematical" points. Indeed, it is difficult to interpret Buridan's reference to the positions one outside of the other of bodies differently from physical indivisibles. If this is so, then, Buridan's case shows that even the masters who were apparently more alien to the geometrical notion of points employed by Aristotle still understood his notion of the (potential) infinite divisibility of magnitudes as concerning the problem of dividing a magnitude at two indivisible entities "immediately next" to each other. Still, it is important to underline that Buridan does never state, in his discussion, that this is the ultimate source of the conceptual impossibility to actualise the infinite division of a magnitude.

Moreover, and this is the second distinctive element of Buridan's analysis of the continuity of magnitudes and of their (potential) infinite divisibility underlined by the passage, Buridan again makes use of a conclusion based on induction, and, more in particular, on an inductive inference whose (minor) premiss is based on everyday experience. Of course, Buridan knows that a concrete process of physical division of material substances can only be a finite process in nature. Still, as he remarks, experience tells us that there is no difference between dividing a body at one of its junctures than at another one[377]. It is this observation that allows to infer that the divisibility of a material substance is, at least in principle, infinite. Yet, this does not mean that Buridan is unaware of the consequences that the repeated division of a material substance can have for its ontological composition, and for its ability to act on the external senses, as it will be shown in the next chapters (and, of course, he perfectly knows that this potential infinite divisibility could never, even conceptually, be actualised).

After this first conclusion, the second one which Buridan takes as a minimally accepted one by all the *moderni* concerns more directly the logical implications of

[377] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 64, ll. 1-4: "Et inductio patet, quia non est ratio quare magis in istas quam in quascumque alias loquendo de partibus quae situm habent extra se invicem et non sunt communicantes, ita quod una non sit pars alterius."

(potential) infinite divisibility at the level of propositional analysis. Buridan, therefore, shifts the plane of the discussion to logic, by remarking that:

> Moreover, all commonly admit well that these propositions are impossible: 'a body has been divided along any of its junctures' or 'a body is divided along any of its junctures'. Or even, according to a more proper way of speaking, this is impossible: 'a body has been divided in all of its parts' […]. Similarly this is impossible: 'a body has been infinitely divided' or 'a body is infinitely divided', because for how much a body has been divided, still it has not been divided in so many parts that it cannot be divided in more; therefore not infinitely. And Aristotle intended these commonly accepted conclusions, when he spoke of act and potency in solving Democritus' argument. Indeed, he said that a body is divisible along any of its junctures in potency, but not in act. And when he said 'and not in act, he intended that the above-mentioned assertorial propositions [i.e., 'a body has been infinitely divided', or 'a body is infinitely divided'] were impossible, still the preceding ones, which concerned possibility [i.e., 'it is possible that a body has been divided', or 'it is possible that a body is infinitely divided'], were true[378].

Here, however, Buridan notes, lies all the difficulty in logical terms:

> It is doubted, moreover, what we should say concerning that principle 'once a possible proposition has been posited in existence etc. [nothing impossible follows]'. Democritus' intention was that the meaning of that principle is that if a proposition concerning possibility is true and it is converted in an assertorial one, nothing impossible follows to the assertorial one. Therefore [he] said that if a body can be divided in all of its parts, then nothing impossible follows from this [proposition]: 'a body has been divided in all of its parts'. But the said gloss of this principle is false[379].

Buridan's strategy, therefore, is different from that of the previous masters analysed who interpreted (potential) infinite divisibility in logical terms. While both Albert and Scotus focused on the issue of the compossibility of the singular propositions included in the universal concerning the fact that a body can be infinitely divided, Buridan focuses on

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[378] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 63, ll. 11-21: "Deinde omnes communiter bene concedunt istas propositiones esse impossibiles 'corpus secundum quodlibet eius signum vel punctum est divisum' vel 'corpus secundum quodlibet eius signum dividitur'. Vel etiam secundum modum loquendi proprium haec est impossibilis 'corpus in omnes eius partes est divisum', [...]. Similiter haec est impossibilis 'in infinitum corpus est divisum' vel 'in infinitum corpus dividitur', quoniam quantumcumque corpus sit divisum, tamen non in tot partes est divisum quod non in plures; igitur non in infinitum."

[379] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 64, ll. 1-7: "Dubitatur adhuc quid debemus dicere ad illud principium 'possibili posito in esse' etc. Intentio Democriti fuit quod sensus illius principii est quod si propositio de possibili est vera et mutetur in unam de inesse, nihil sequitur impossibile ad illam de inesse. Ideo dixit quod si corpus in omnes eius partes potest dividi, tunc ad istam 'corpus in omnes suas partes est divisum' nihil sequitur impossibile. Sed dicta glossa huius principii est falsa."

the issue of the conversion from such modal universal proposition concerning possibility into the corresponding assertorial one. Secondly (and relatedly), Buridan's aim is not so much to disprove the specific case of (potential) infinite divisibility, rather, to provide a classification of all the counter-instances to the general principle that the conversion from a true (universal or particular) modal proposition concerning possibility into the corresponding assertorial one does not produce any impossibility, or, to put it in other words, that the resulting assertorial proposition is also true. Buridan identifies three cases.

The first case (the one which, by all evidence, Buridan thinks applies to potential infinite divisibility) concerns universal propositions or propositions including a collective term (*terminus distributus*). Buridan's example is the sentence 'you can see every star' (*omnem stellam tu potes videre*). In this case, once the proposition is converted in the corresponding assertorial one (*omnem stellam tu vides*), an impossibility ensues. Of course, this is a proposition concerning a "natural", not a conceptual, impossibility. Indeed, as Buridan notes, in this case the impossibility of seeing all the stars is due to the fact that part of them is visible only from one hemisphere, and another only from the other hemisphere. Buridan also introduces a second example, 'every man can die' (*omnis homo potest mori*). Even in this case, however, as Buridan notes, the corresponding assertorial proposition, 'omnis homo moritur', entails an impossibility, since, in this case, the whole human species would cease to be and this would deprive the universe of part of its perfection. Now, it is clear, even at first glance, that the second proposition is not founded on a "natural" impossibility (it might, after all, be the case, from the natural point of view, that a particularly dramatic plague, or a natural catastrophe, could completely erase the human species from earth). Rather, it depends on a metaphysical impossibility (the maintenance of the overall perfection of the universe). This said, it could still be claimed that the two propositions belong to the same genus, insofar as in both cases "[…] to the truth of such proposition concerning possibility it is enough that to none of the corresponding assertorial singular ones [i.e., that from the conversion from the modal singular propositions to the corresponding assertorial singular propositions] an impossibility ensues"[380]. However, it should be remarked that, in this way, Buridan

[380] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 64, ll. 18-20: "[...] ad veritatem talis propositionis de possibili sufficit quod ad nullam singularem suam positam in esse sequatur impossibile."

completely avoids to consider the case of the compossibility of the modal singular propositions, differently from what had been done by Scotus.

Buridan, then, introduces a second case, concerning "[…] indefinite or singular propositions where the subject and the predicate are incompatible with each other"[381], such as 'white can be black' (*album potest esse nigrum*) and 'a boy can be an old man' (*puer potest esse senex*). In such cases, the conversion of the (determinate or indeterminate) modal singular proposition into the corresponding assertorial one immediately entails an impossibility. Buridan, always reasoning in terms of the conversion from modal propositions to the corresponding assertorial ones, remarks that the only way to claim that no impossibility ensues from the conversion into assertorial form of the modal proposition 'white can be black' is to replace the grammatical subject with a demonstrative pronoun, so as to get a proposition of the kind 'this (white) body x can be black'[382].

The third case analysed by Buridan concerns modal propositions which are possible (therefore true) at a given time in the future, but not in the present, so that the corresponding assertorial propositions would entail an impossibility. For instance, in Buridan's example, it is true that 'a new-born can run in the future' (*ille (sc. infans) potest currere in tempore futuro*), in the sense that he will be able to run once he will have grown sufficiently. However, the corresponding assertorial proposition 'that infant runs in the future' (*ille (sc. infans) currit in tempore futuro*) entails an impossibility, insofar as the predicate is expressed with a present tense, while the proposition refers to the future. Only when the new-born will have grown sufficiently, it will be possible to claim that from the conversion of the same modal proposition into the corresponding assertorial one no impossibility ensues. In the case at hand, therefore, the conversion from the modal to the assertorial proposition does not entail an impossibility only if the assertorial proposition is reformulated with a periphrasis of the kind 'the new-born has a body which, once

[381] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 64, ll. 22-23: "[...] propositionibus indefinitis vel singularibus ubi subiectum et praedicatum connotarent repugnantiam."

[382] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 64, l. 26-p. 65, l. 5: "Et igitur, sicut communiter dicitur, tales propositiones de possibili si reducantur ad propositiones de inesse possibiles, debet auferri a subiecto illa connotatio quae repugnat praedicato, ita quod subiectum ponatur sub pronomine demonstrativo demonstrante rem pro qua subiectum supponebat, sicut si haec est vera 'album potest esse nigrum', tunc illo albo demonstrato haec est possibilis 'hoc est nigrum'."

sufficiently developed, makes him able to run', or, more simply, 'a new-born [better, a boy] runs, provided his body is sufficiently developed'[383]. Now, this is of course a case that, again, is not relevant to the issue of (potential) infinite divisibility. Moreover, this case is one where the possibility of converting a given modal proposition into the corresponding assertorial one depends on certain additional conditions, so that 'x can run' is possible only when x is a man belonging to a certain range of age – neither a new-born nor extremely old – and when he or she is sufficiently healthy.

At the end of this analysis, Buridan makes it clear that he is well aware that his discussion does not cover the issue of *incompossibilia*. Nevertheless, in his view this discussion should be treated in connection with the issue of the (simultaneous) actualisation of alternative states of affairs (logically represented by the conjunction of assertorial propositions obtained by the conversion of the corresponding modal ones). The impossibility to actualise alternative states of affairs is thus (too) briefly mentioned by Buridan with reference to the classical example of the incompossibility of sitting and be standing at the same time[384]. The logical impossibility of the (potential) infinite divisibility of a magnitude, however, is not situated merely at the level of assertorial propositions themselves, but rather, as said, at the level of the conversion from modal propositions to the corresponding assertorial ones.

More specifically, as Buridan clarifies at this point, by providing his own *determinatio* of the question at hand:

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[383] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 65, ll. 6-21: "Adhuc credo quod sit tertia instantia, scilicet si praedicatum implicet repugnantiam ad tempus praesens importatum per verbum de inesse. Verbi gratia, ut de infante modo nato loquendo haec est vera 'ille potest currere in tempore futuro'. (Quia certum est quod haec est vera 'ille potest currere', eo quod ipse curret de facto aliquando. Et si ipse potest currere, tunc ipse potest currere in aliquo tempore, quoniam impossibile est moveri nisi in tempore. Aut igitur ipse potest currere in illo praesenti tempore, aut in tempore iam praeterito, aut in tempore futuro. Non potest dici quod potest currere in illo praesenti tempore, puta in hac die, quia non habet membra adhuc apta. Et adhuc minus est concedendum quod possit currere in tempore praeterito. Igitur haec est vera 'ille potest currere in tempore futuro'.) Et tamen illa de inesse est impossibilis, scilicet 'ille currit in tempore futuro'. Igitur reducendo tales propositiones de possibili ad possibiles de inesse auferenda est connotatio praedicati repugnans verbo de praesenti de inesse. Et tunc posset concedi quod in sensu sic modificato illud principium haberet suam veritatem."

[384] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 65, ll. 22-28: "Et iterum, si loquamur de possibilitate attributa rebus quae non sunt propositiones, adhuc posset dici quod, omni possibili posito in esse ubi et sicut et quando et possibile et sic de aliis circumstantiis, nihil sequitur impossibile. Tamen saepe contingit quod si aliqua duo vel tria possibilia ponerentur in esse, impossibile sequeretur. Nam te possibile est sedere et te possibile est stare, et ad positionem quod stas et sedes sequitur bene impossibile."

> To the question I say that in the issue concerned propositions concerning possibility in a divided sense (*in sensu diviso*) are true, i.e., that a body can be divided in all of its parts, and equally a body can have been divided in all of its parts and a body can have been divided in an infinity of parts, because [it can never have been divided] in so many that there are no more (*non in tot quin in plures*)[385]. But propositions concerning possibility in a composed sense (*in sensu composito*) are to be denied, i.e., 'it is possible that a body is divided or has been divided in all of its parts', because the meaning would be that this [proposition] is possible: 'a body is divided or has been divided in all of its parts', and, however, it has been said that this is impossible[386].

Buridan's conclusion could not be clearer. Two meanings of the modal proposition 'a body can be divided (or can have been divided) in all of its parts' need to be distinguished, if one is to understand in what sense the conversion of such a proposition in the corresponding assertorial one entails an impossibility. The two meanings correspond to a traditional distinction that, although finding a basis in Aristotle (cf. *De sophisticis Elenchis* 166a22 ff.), was largely an independent creation of Medieval Latin logic. This is the distinction between the *sensus divisus* and the *sensus compositus* of a modal proposition[387]. As Thijssen and Murdoch summarise Buridan's understanding of it:

> In Buridan's and many other fourteenth-century scholars' discussion, the distinction between divided and composite senses had evolved into a distinction between composite and divided propositions (*propositiones compositae/divisae*). If the

[385] Here Buridan makes explicit reference, be it said incidentally, to one of the expressions that was most frequently used by Medieval Latin commentators to characterise the notion of infinity by division implied by (potential) infinite divisibility. The expression *non tot quin plures*, therefore, by referring to the ever greater number of parts resulting from the actualisation of a process of (potential) infinite division, together with its correlative expression of 'tot quod non plures' (to refer to the number of parts resulting from a fully actualised process of division), acted as a synonym of the expression, already encountered in Scotus, of *in fieri* to refer to the process of (potential) infinite divisibility, as opposed to the expression of *in facto esse* to refer to a fully actualised process of division. Another (not fully equivalent, however) terminological distinction that became prominent in 14th-century discussions of (potential) infinite divisibility is that between the categorematic and the syncategorematic uses of the term 'infinite'. Unfortunately, it is not possible to discuss this distinction here. For an introduction to Buridan's use of it in his discussion of (potential) infinite divisibility in Liber III, q. 18 of the *ultima lectura* on the *Physics*, see THIJSSEN, MURDOCH, *John Buridan on Infinity*, *op. cit.*, pp. 130-134.

[386] JOHN BURIDAN, *Quaestiones super De generatione et corruptione*, Liber I, q. 5, ed. STREIJGER, BAKKER, THIJSSEN, p. 66, ll. 1-8: "Ad quaestionem dico quod in quaesito propositiones de possibili in sensu diviso sunt verae, scilicet quod corpus in omnes eius partes potest dividi, immo corpus in omnes eius partes potest esse divisum et in infinitas partes corpus potest esse divisum, quia non in tot quin in plures. Sed propositiones de possibili in sensu composito sunt negandae, videlicet 'possibile est corpus in omnes eius partes dividi vel esse divisum', quia sensus esset quod haec est possibilis 'corpus in omnes eius partes dividitur vel est divisum', et tamen dictum fuit quod haec est impossibilis."

[387] For an introduction to the uses of the distinction in Medieval Latin logic, the fundamental starting point remains N. KRETZMANN, "*Sensus compositus*, *Sensus divisus*, and Propositional Attitudes", *Medioevo. Rivista di storia della filosofia medievale* VII, 1981, pp. 195-230. Concerning Buridan's use of the distinction in his discussion of (potential) infinite divisibility in the context of his commentary de ultima lectura on *Physics* III.4-8, see THIJSSEN, MURDOCH, *John Buridan on Infinity*, *op. cit.*, esp. pp. 134-140.

> position of the modal operator is at the beginning or end of a proposition it is composite. In that case, the modal operator affects the entire proposition. If, however, the modal operator (*modus*) intervenes between what is being expressed by the subject and the predicate, it is a divided proposition. In the latter case, the modal operator only modifies the copula. The Proposition "That a man runs is possible" (*Hominem currere est possibile*), for instance, is a composite proposition, whereas the proposition "For a man it is possible to run") (*Hominem possibile est currere*) is divided[388].

In the case at hand, if 'a body can be divided in all of its parts' is considered *in sensu composito*, the modal proposition comes to mean that it is possible to divide a body in all of its parts, that is, in *every* part. On the contrary, if 'a body can be divided in all of its parts' is considered *in sensu diviso*, the modal proposition comes to mean that, in all of its parts (that is, in any part of it whatsoever), it is possible that a body is divided. As a consequence, it is clear that the modal proposition at hand, if considered *in sensu composito*, cannot be converted into the corresponding assertorial one (which, in this case, can be thought of as the conjunction of all the singular propositions concerning division at each point of a continuum) without the consequence that an impossibility ensues (although Buridan fails to mention to what of the three cases that he has distinguished this instance belongs). If, however, the proposition is considered *in sensu diviso*, then no impossibility ensues from the conversion of the modal proposition at hand into the corresponding assertorial one (which, in this case, can be thought of as the conjunction of all the sets of the exclusive disjunctions of the singular propositions concerning division at each point of a continuum).

Buridan's analysis of the notion of (potential) infinite divisibility, therefore, helps to show how many different theoretical models, by the mid-14th century, had been put in place by Medieval Latin commentators in trying to understand this complex Aristotelian notion, with increasingly divergent conceptual results. Indeed, Buridan's model clearly departs from the main line of interpretation of (potential) infinite divisibility with the tools of modal logic, one best instantiated by Scotus' analysis of *incompossibilia*. Buridan's analysis, moreover, shows that the importance of the logical understanding of (potential) infinite divisibility was producing, in the first half of the 14th century, a progressive neglect of the ultimate conceptual foundation of the solution to the "atomistic dilemma", something which, albeit briefly, was still mentioned by Scotus, as seen above.

[388] THIJSSEN, MURDOCH, *John Buridan on Infinity*, *op. cit.*, pp. 135-136.

1.6. Conclusions

In conclusion, some main elements concerning the development of the notion of the continuity of magnitudes and of their (potential) infinite divisibility from Aristotle to the Medieval Latin commentators can be recognised.

The first, and probably the most important one, is that in Aristotle continuity was understood primarily in connection with the "production" of a new single entity (taken to be mereologically simple in a relevant sense) by the “fusion” of the extremities of different entities and only derivatively in connection with the division of the same entities according to their extremities still existing in potency in the continuum they have formed (the two perspectives being, evidently, complementary). Nevertheless, in the commentary tradition the former perspective was progressively eclipsed by the latter one. While, indeed, in Late Ancient commentators there was still a strong interest in trying to reconcile the two perspectives, in the Medieval Islamic and, especially, Latin tradition continuity came to be associated almost exclusively with the idea of (potential) infinite divisibility (although it remained clear throughout that continuity was to be defined as the fact that two extremities of separate entities become one). There were, it is true, some theoretical oscillations. I have mentioned them, for instance, in connection with Albert the Great and Thomas Aquinas. Even in these cases, however, the definition through (potential) infinite divisibility was put on an equal footing with the one based on the 'becoming one' of the extremities of different entities, as an *alia definitio*, without replacing it and without prevailing upon it.

Secondly, the very notion of (potential) infinite divisibility underwent profound changes from Aristotle to its Medieval Latin commentators. In Aristotle, as seen, the impossibility to actualise (neither conceptually nor "physically") the (potential) infinite divisibility of a continuous magnitude is due, first and foremost, to the fact that the division of a magnitude always occurs at a point (indeed, a point is understood, in Aristotle, as the act of a division), and two points cannot be “immediately next” to each other, insofar as a point exists only as the limit of a line, and not as an independent entity, so that two divisions must always be separated by an undivided “portion” of a continuous magnitude. This idea, while still being clear to Late Ancient, Islamic and Medieval Latin commentators, was progressively replaced, in the Medieval Latin commentary tradition, by a logical analysis founded on the notion of the incompossibility ensuing from the

conjunction of the singular modal propositions regarding the possibility of the division of a continuous magnitude at all of its points. This logical analysis, while being already present in the mid-13th century (as the case of Albert the Great shows) flourished especially at the end of the same century, thanks to John Duns Scotus, and continued to feature prominently (although with important conceptual modifications and with the use of different theoretical tools) in the 14th century (as evident in John Buridan).

Thirdly, and lastly, I believe to have shown that the Aristotelian notion of the continuity of magnitudes has always been haunted by the fundamental ambiguity concerning the Aristotelian (in)distinction between geometrical entities and the material substances on which they ontologically depend and in which they are ontologically grounded. The debate concerning the statute of geometrical entities in Aristotle is far from settled even in contemporary scholarship, and certainly it constituted an important element of disagreement among Late Ancient and Medieval commentators. In this chapter I have not attempted to step into this intricate debate, whose implications lie flatly outside the scope of my investigation. Still, I have tried to show that the positions that commentators adopted concerning the relation between geometrical and material entities had important implications also for their analysis of the continuity of magnitudes. Indeed, while in Aristotle it is quite apparent (especially in the *Physics*, but also in the *De generatione*) that, although the geometrical and the material levels of analysis are clearly distinguished, the main focus of analysis is the problem of the continuity of "enmattered" magnitudes (which, then, extends to the issues of the continuity of motion and of time), different interpretations emerged throughout the (especially Medieval) commentary tradition. In particular, a clear element which is already evident in Albert the Great's analysis of continuity, and which received its most systematic treatment in John Duns Scotus, never to be abandoned afterwards, is the increasing divergence of the geometrical level of analysis from the material one. This process of progressive divergence, however, originated by a further conceptual development which has roots that go back at least to the mid-13th century in the Latin world. Indeed, I have shown how, at least since Albert the Great (and Roger Bacon), the tradition stemming from Euclid's *Elements* and al-Nayrizi's commentary upon them (together with additional Islamic sources, such as Al-Ghazālī's *Metaphysics*) overlapped with the understanding of the continuity of magnitudes, thus giving impulse to a specific (and progressively more prominent)

geometrical line of argumentation against all sorts of (conceptual and physical) "indivisibilism"[389]. Some geometrical remarks were, it is true, already present in Aristotle (and some more had been developed in the Islamic tradition), but they represented only a minor element, so that the full-fledged geometrical analysis of the continuity of magnitudes can reasonably be considered a Medieval Latin innovation, one that becomes especially pronounced at the beginning of the 14th century, following John Duns Scotus. This does not mean, however, that the two levels of analysis ever came to be considered fully independent from each other, even at that point. It must always be kept in mind, indeed, that the purely geometrical (or, better, mathematical) analysis of continuity is a modern innovation, since Medieval Latin Aristotelian commentators, even though in a sometimes ambiguous way, never renounced to the belief that geometrical objects are abstracted from material substances.

Be that as it may, I hope to have shown that the belief in the continuity of magnitudes and in their (potential) infinite divisibility is a deeply entrenched one, both in Aristotle's own natural philosophy and in that of his commentators, most notably Medieval Latin ones. To borrow a terminological distinction taken from Imre Lakatos' methodology of the scientific research programmes[390], the continuity of magnitudes and their (potential) infinite divisibility are part of the "hard core" of (Late Antique and Medieval) Aristotelian natural philosophy, rather than of its "protective belt", so that by renouncing to them one cannot maintain an Aristotelian natural philosophy at all. It is this presupposition, and not its denial, that makes it possible, for commentators (especially Medieval Latin ones) to talk of *minima naturalia* and of *minima sensibilia*, as I will show in the following chapters of this thesis.

[389] Note that the influence of this geometrical tradition on Medieval Latin commentators might constitute one of the reasons why they linked continuity so inextricably with (potential) infinite divisibility and why they, contrary to Aristotle, tended to attribute to points a "constructive" role in the constitution of continuous magnitudes (this is particularly apparent, for instance, in Albert's definition of points as the matter of a line and of a line as resulting from the flux of a point).

[390] Cf. I. LAKATOS, *The Methodology of Scientific Research Programmes (Philosophical Papers Vol. 1)*, J. WORRALL, G. CURRIE (eds.), Cambridge, Cambridge University Press, 1978.

CHAPTER 2

The Medieval Debate on the Issue of *Minima naturalia*: A Reappraisal

2.1. Introduction

Aristotle, as I have already stated in the general Introduction to the thesis, never developed a full-fledged theory of *minima naturalia*. The remarks on this issue are scattered throughout his *corpus* and, what is more, the most important passage to which the issue came to be associated in the commentary tradition, i.e., *Physics* I.4, does not even deal with the issue of *minima naturalia* strictly speaking, since there Aristotle does not even mention (substantial) forms, which would have been introduced as a principle of nature only in *Physics* I.7[391]. Indeed, one could claim that the only passage in the *corpus* where the issue of *minima* is discussed by Aristotle in a hylomorphic framework is *De sensu* 6, 445b3-446a20, that is, the passage which is at the centre of the present thesis, and which, however, discusses *minima sensibilia* rather than *minima naturalia*. This aspect also helps explaining one of the most striking elements of the Late Ancient and Medieval commentary tradition on the issue of *minima naturalia* (one which has largely been neglected by modern scholars), namely, the fact that the *auctoritas* of *De*

[391] The notion of substantial form (albeit only that of living beings, i.e. their soul) is, instead, explicitly taken into account into the other main passages that came to be associated with the issue of *minima naturalia* in the commentary tradition, namely, *De generatione* I.5, which, in discussing the issue of the augmentation of living beings due to nutrition, poses the problem of whether every part of a living being is augmented when the whole is augmented, and *De anima* II.4, 416a16-17, where Aristotle states unequivocally that every living being has limits to its size both in greatness and in smallness. Nevertheless, it is far from clear that in discussing this issue Aristotle is providing any direct hint at a hylomorphic theory of *minima naturalia*. Indeed, the case of living beings is a relatively uncontroversial one, insofar as the notion of an extremely small man, animal or plant goes explicitly against experience and also against some fundamental elements of the definition of living beings themselves (living beings need different component parts in order to fulfill their basic functions). Still, Medieval Latin commentators, interestingly, took these passages as opportunities to discuss the controversial case of *minima naturalia* in inanimate homogeneous substances, therefore using them as additional support to a hylomorphic theory of *minima naturalia tout court*. I leave aside the issue of *De caelo* I, while I do not take *De generatione* I.10 as being part of the list. Indeed, although some commentaries to *De generatione* I.10 will be quoted in this chapter, the text, which deals with the issue of the conditions of a true mixture, and which rebukes the idea that a mixture might be caused by the juxtaposition of "minimal" parts of its components, is better understood as part of a group of Aristotelian passages of indirect relevance to the issue of *minima naturalia*, which provide important criticisms to various kinds of atomistic doctrines concerning the composition of material substance (in this sense, *De generatione* I.10 is rather closer to *De generatione* I.8, analysed in the previous chapter of the thesis, than to *Physics* I.4).

sensu 6 is frequently cited as a key passage in discussing the issue of *minima naturalia* and, as the chapter will show, some of the most influential interpretations of *minima naturalia* in the Medieval Latin world find their origin in different readings of *De sensu* 6. In a sense, the history of the commentary tradition on *minima naturalia* is, for an important part, a history of the readings of *De sensu* 6.

Given this, it becomes clear why a chapter dedicated to *minima naturalia* is relevant to a thesis dealing with the issue of *minima sensibilia* based on the text of *De sensu* 6. Nevertheless, the aim of the chapter is not only to provide a reconstruction of the Late Ancient and Medieval commentary tradition on *minima naturalia* which does justice to the pivotal role played in it by the text of *De sensu* 6. Indeed, along the way, it also purports to develop a more fine-grained interpretation of Late Ancient and, especially, Medieval Latin theories of *minima naturalia*. This is useful, first of all, in view of the greater availability, today, of critical editions of Medieval Latin commentaries, particularly on the *Physics*, which allow to improve the reconstructions already provided by modern scholars, such as, most recently, John Murdoch. Secondly, insofar as the issue of *minima naturalia* is, theoretically, preliminary to that of *minima sensibilia* (given that the accidental forms of sensible qualities can only exist, in Aristotelian terms, by inhering in a hylomorphic compound of matter and substantial form), any thesis trying to analyse the positions of commentators regarding the latter issue while disregarding the former would be severely incomplete.

In what follows, therefore, I will provide a thorough reconstruction of the debate on *minima naturalia*, starting from an analysis of the relevant passages of the Aristotelian *corpus* and then going through its Late Ancient, Islamic and Latin commentators. The methodology, however, will be different from the one adopted in the first chapter of the thesis. Indeed, contrary to what happens in the case of the continuity of magnitudes and of their (potential) infinite divisibility, in the case of *minima naturalia* one of the passages of the Aristotelian *corpus* to which the issue is linked, namely, *Physics* I.4, plays a far more central role in the commentators' analyses than all the others. This is not because this passage is particularly useful in order to solve the issue of *minima naturalia* (this is rather, at least partially, the role of *De sensu* 6), but because it provides the *locus classicus* for its discussion. That is to say, merely by looking at Late Ancient and Medieval commentaries on *Physics* I.4 it is possible to reconstruct the historical development of the

issue of *minima naturalia*. Therefore, contrary to what has been done in the previous chapter, in this one (and in the following ones, for that matter) I will restrict the Aristotelian "basis" of the discussion, but, at the same time, I will enlarge the number and variety of the Medieval Latin positions and thinkers discussed[392]. Still, this does not mean in any way that I will try to provide an exhaustive overview of Medieval Latin commentaries on *Physics* I.4. This would be, even only for the period around ca. 1250-ca. 1350, that is, the period which the thesis takes into account, an unbelievably burdensome task[393]. More modestly, but also, I believe, more effectively, given the purpose of this thesis, I will focus on the authors, within this timeframe, who also commented upon *De sensu* 6 (so as to be able to thoroughly compare, and to discuss in a unitary fashion, their position on *minima naturalia* and on *minima sensibilia* respectively) and authors who, although they did not comment on *De sensu* 6 (or, at least, of whom no commentary on *De sensu* 6 is extant) still can positively contribute to shed light on the Medieval Latin debate on *minima sensibilia* that will be at the centre of the subsequent chapters of this thesis. This said, I am also confident that the intellectual journey that I will illustrate throughout this chapter will also prove useful in order to improve our understanding of Medieval Latin doctrines of *minima naturalia* in their own right.

[392] This does not mean, however, that I will only mention Medieval Latin commentaries on *Physics* I.4. when relevant to the analysis, I will also refer to commentaries on other Aristotelian works, especially, but not exclusively, on Book I of *De generatione*. These texts, however, will never be discussed in their own right, but always in connection with commentaries on *Physics* I.4, which, therefore, remain the main focus of the chapter.

[393] To have an idea of the number and variety of *Physics* commentaries of the period preserved, it suffices to look at the classical repertory of manuscript witnesses of unedited Medieval Latin *Metaphysics* and *Physics* commentaries provided by Albert Zimmermann: A. ZIMMERMANN, *Verzeichnis Ungedruckter Kommentare zur* Metaphysik *und* Physik *des Aristoteles aus der Zeit von Etwa 1250-1350*, Leiden, Brill, 1971. To the 26 commentaries, either attributed or anonymous, whose witnesses are listed by Zimmermann (some of which have been critically edited since then) one should also add all those available in critical or early modern printed editions. The overall number of commentaries one obtains by these simple considerations (roughly around 40), which is far from being exhaustive, is, in any case, already significant. The number, however, becomes impressive (certainly well over 100) if one considers all the *Physics* commentaries dating around 1250-1350 whose witnesses are listed in the repertories included in the bibliography of the Appendix to this thesis. Incidentally, I take the opportunity to remark that it is to be particularly regretted that we do not possess, at the present state of research, a complete inventory of Medieval Latin *Physics* commentaries. In the Appendix to the present thesis I remedy this absence for what concerns Medieval Latin *De sensu* commentaries, but, certainly, such an inventory would *a fortiori* be needed for a crucial work such as the *Physics*.

2.2. The Source of the Debate: *Physics* I.4 (and *De sensu* 6)

The first two books of the *Physics* constitute one of the privileged entry points into Aristotelian natural philosophy as a whole[394]. The general aim and structure of Book I is still a matter of debate[395], but it is at least undeniable that Aristotle conceives of it as a 'beginning[396]' into the enquiry of natural science, and especially an enquiry whose aim is to "try to determine the things concerning the principles [of nature]" (*Physics* I.1, 184a15-16). In this sense, the whole book sets the frame for the (new) beginning marked by Book II, and especially II.1, where 'nature' (the subject matter of physics) is defined, thanks to the principles of privation, matter and form identified and argued for in the course of Book I.

The role of chapter 4 of Book I, in this general framework, is especially relevant. Indeed, after having discussed and refuted the opinions of the Eleatic philosophers, who believed in a unique principle of nature (in *Physics* I.2-3), Aristotle starts discussing the positions of the philosophers who posit more than one principle. More than that, *Physics* I.4 is also the starting point of the positive itinerary of *Physics* I, since, differently from the Eleatics, the natural philosophers who, like Anaxagoras, admitted change in nature (and correlatively a variety of principles) did provide accounts (however wrong ones) of what Aristotle takes to be the subject matter of natural philosophy, that is, what has in itself the principle of its change (cf. *Physics* II.1). More than that, the philosophers whose accounts are discussed starting with *Physics* I.4 are taken by Aristotle to progressively approximate the correct account of natural philosophy that he starts to provide in *Physics* I.7[397].

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[394] It is generally agreed in contemporary scholarship that the first two Books of the *Physics* tend to form a thematic and structural unity, introducing historically and conceptually the main concepts of Aristotelian natural philosophy (matter, form, privation, the classification of the four causes, etc.). The opposite view has famously been advocated by ARISTOTLE, *Aristotle's* Physics. *A Revised Text with Introduction and Commentary*, ROSS (ed.), *op. cit.*, p. 449, according to which there is no "organic unity" between the two books, and it has recently been restated, among other, by Mariska Leunissen (cf. M. LEUNISSEN, *Aristotle's* Physics*: A Critical Guide (Cambridge Critical Guides)*, Cambridge, Cambridge University Press, 2015, p. 2).

[395] For a recent overview, cf. D. QUARANTOTTO, *The Role, Structure and Status of Aristotle's* Physics *I*, in EAD. (ed.), *Aristotle's* Physics *Book I. A Systematic Exploration*, Cambridge, Cambridge University Press, 2018, pp. 18-57).

[396] On the varieties of meaning of the notion of 'beginning' adopted by Aristotle in *Physics* I, see QUARANTOTTO, *The Role, Structure and Status of Aristotle's* Physics *I*, *op. cit.*

[397] Aristotle himself notes that the discussion of Eleatic monism lies outside the competence of the natural philosopher, since it is more properly understood as a metaphysical account, rather than a "physical" one, dealing with the principles of nature. The argument given by Aristotle, significantly, is that a principle, in

Among them, the most extreme position concerning nature, and especially its principles, is that of Anaxagoras, who believed in a (numerical) infinity of principles[398]. The notion of infinite principles of nature is extremely dangerous, for Aristotle, for two main reasons. Ontologically, by positing a number of principles that is by definition not inferior to the number of things of which they are principles, the whole notion of 'principle' as something more fundamental than what it is a principle of loses its meaning. Epistemologically, if the principles of material substances are infinite, then it is not possible to know them (*Physics* I.4, 187b7-13). Therefore, this position makes the knowledge of the structure and actions of material substances utterly impossible. It is no wonder, then, that Aristotle uses no less than five[399] separate (even though sometimes consecutive[400]) arguments in order to refute Anaxagoras' position.

Before listing and discussing the arguments, it is useful to recall exactly what is the position that Aristotle is criticising[401]. Indeed, Anaxagoras (considered as an expounder of "the common opinion of the physicists[402]", according to which nothing comes to be from not being) is considered holding the following theory about the principles of material substances:

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order to be properly called as such, must be a principle of something different from itself, and therefore a position that denies the existence of multiplicity cannot properly be called a science of the principles of nature (cf. *Physics* I.4, 184b25-185a20, esp. 184b27-185a4).

[398] Cf. *Physics* I.4, 187a27.

[399] The ambiguities concerning the number of arguments presented by Aristotle depend on the fact that some of them can be divided in sub-arguments (cf. especially *Physics* I.4, 187b35-188a2, which can be considered as an independent argument or as a mere restatement of the argument contained in *Physics* I.4, 187b22-34).

[400] More precisely: argument 3 depends on argument 2, while arguments 1 and 5 are strictly related, although none of them entails – logically speaking – the other.

[401] One *caveat* must be posited at the outset of the exposition: Anaxagoras' extant fragments are a few and of extremely difficult interpretation. Therefore, it is hard to develop a complete understanding of Anaxagoras' metaphysics from them and to compare it to how Aristotle characterises it in *Physics* I.4. However, one point seems to be particularly noteworthy in this respect: the need to clarify what exactly is his notion of the (potential) infinite divisibility of magnitudes, although it certainly represents a concern for Aristotle's own natural philosophy, as has been shown in the previous chapter, and although it is influenced to a significant extent by the need to confront those who, like Leucippus and Democritus, deny such infinite divisibility, is also specularly motivated by the urge to confront those who, like Anaxagoras, posit that every natural entity is not only infinitely divisible, but rather infinitely divided "in act" (see A. MARMODORO, *Everything in Everything. Anaxagoras' Metaphysics*, Oxford, Oxford University Press, 2017, esp. the Introduction, for this interpretation).

[402] ARISTOTELES, *Physica* I.4, 187a27-28, ed. ROSS: "τὴν κοινὴν δόξαν τῶν φυσικῶν". Translatio vetus, ed. BOSSIER, BRAMS, p. 18, l. 18: "communem opinionem phisicorum". Translatio Vaticana, ed. MANSION, p. 9, l. 23: "communem opinionem physicorum". Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 34): "communem opinionem physicorum". Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 21vM): "communem opinionem physicorum".

> The one, they reasoned, must have already existed in the other; for since everything that comes into being must arise either from what is or from what is not, and it is impossible for it to arise from what is not (on this point all the physicists agree), they thought that the truth of the alternative necessarily followed, namely *that things come into being out of existent things, i.e. out of things already present, but imperceptible to our senses because of the smallness of their bulk. So they assert that everything has been mixed in everything, because they saw everything arising out of everything* […][403].

The passage offers a clear statement of the two main theses that Aristotle clearly attributes to Anaxagoras' natural philosophy:

1. Everything comes to be out of everything (since nothing comes to be out of nothing, and since it is considered an empirical fact that everything is *seen* as coming to be out of everything).
2. Everything is present in everything.

[403] ARISTOTELES, *Physica*, I.4, 187a31-b2, ed. ROSS: "ἔτι δ᾽ἐκ τοῦ γίγνεσθαι ἐξ ἀλλήλων τἀναντία· ἐνυπῆρχεν ἄρα· εἰ γὰρ πᾶν μὲν τὸ γιγνόμενον ἀνάγκη γίγνεσθαι ἢ ἐξ ὄντων ἢ ἐκ μὴ ὄντων, τούτων δὲ τὸ μὲν ἐκ μὴ ὄντων γίγνεσθαι ἀδύνατον (περὶ γὰρ ταύτης ὁμογνωμονοῦσι τῆς δόξης ἅπαντες οἱ περὶ φύσεως), τὸ λοιπὸν ἤδη συμβαίνειν ἐξ ἀνάνκης ἐνόμισαν, *ἐξ ὄντων μὲν καὶ ἐνυπαρχόντων γίγνεσθαι, διὰ μικρότητα δὲ τῶν ὄγκων ἐξ ἀναισθήτων ἡμῖν. διό φασι πᾶν ἐν παντὶ μεμῖχθαι, διότι πᾶν ἐκ παντὸς ἑώρων γιγνόμενον* […]" (my emphasis). Translatio vetus, ed. BOSSIER, BRAMS, p. 19, ll. 2-11: "amplius autem ex eo quod fiunt ex alterutris contraria; inerant ergo; si enim omne quidem quod fit necesse est fieri aut ex his que sunt aut ex his que non sunt, horum autem unum quidem ex his que non sunt aliquid fieri inpossibile est (de hac enim conveniunt opinione omnes qui de natura sunt), reliquum iam contingere ex necessitate putarunt, *ex his que sunt et insunt fieri, sed propter parvitatem magnitudinem ex insensibilibus nobis. Unde dicunt omne in omni misceri, propter id quod omne ex omni videbant fieri* […]." Translatio Vaticana, ed. MANSION, p. 9, l. 26-p. 10, l. 6: "Amplius ex fieri ex ad inuicem contraria: inferunt igitur. Si namque omne quidem genitum necesse fieri aut ex entibus aut ex non entibus, horum autem ex non entibus fieri impossibile: nam de ea concordant opinione omnes de natura, iam igitur accidere ex necessitate putauere, *ex eis autem que sunt et insunt fieri, sed propter paruitatem altitudinum nobis ex insensibilibus. Quapropter omne dicunt in omni misceri, eo quod omne ex omni intuens factum* […]." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 34): "Amplius, ex eo quod fiunt ex alterutris contraria: inerant ergo. Si enim omne quod fit, necesse est fieri aut ex iis quae sunt, aut ex iis quae non sunt; horum autem illud quod est ex iis quae non sunt aliquid fieri, impossibile est (de hac enim conveniunt opinione omnes qui de natura sunt); reliquum iam contingere ex necessitate putaverunt, *ex iis quae sunt et insunt fieri, sed propter parvitatem magnitudinum ex insensibilibus nobis. Unde dicunt omne in omni misceri, propter id quod omne ex omni videbant fieri* […]". Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 22rC-D): "Amplius autem ex eo quod fiunt ex alterutris contraria: inerant ergo. Si enim omne quod fit, necesse est fieri aut ex iis quae sunt, aut ex iis quae non sunt, horum autem id quod est ex iis quae non sunt fieri impossibile est (de hac enim conueniunt opinione omnes qui de natura); reliquum iam contingere ex necessitate putauerunt, ex iis quidem quae sunt et insunt fieri, sed propter paruitatem magnitudinum ex insensibilibus nobis. Unde dicunt omne in omni misceri, propterea quod omne ex omni videbant fieri […]".

The two theses are not reciprocally independent. On the contrary, Aristotle is clear in showing that the second directly follows from the first[404]. Indeed, more precisely, it is possible to represent it as a conclusion of a deductive inference, whose premises are (1) and the principle that generation is a mere process of segregation[405].

The presentation of Anaxagoras' position on the principles of nature is then complemented by the reference to the well-known criterion according to which the (perceptible) differences among material substances depend on what is the element that quantitatively prevails in them:

> […] but things, as they say, appear different from one another and receive different names according to what is numerically predominant among the innumerable consituents of the mixture. For nothing, they say, is purely and entirely white or black or sweet, or bone or flesh, but the nature of a thing is held to be that of which it contains the most[406].

[404] This is also (among others) the reconstruction of Aristotle's presentation of Anaxagoras' theses provided by Themistius: "Two things seem to have led Anaxagoras to this doctrine [i.e., that everything comes to be out of everything and, consequently, that everything is present in everything]. One was the *sight* of opposites [indeed, of all things] coming to be from opposites [from all things] […]. But second and predominant was the doctrine common to all natural scientists, by which they all similarly believed that nothing came to be from what is not" (THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, 13.28-34; translation taken from THEMISTIUS, *On Aristotle* Physics *1-3*, TODD (trans.), *op. cit.*, p. 31, my emphasis).

[405] Cristina Cerami (cf. C. CERAMI, "Corps et continuité. Remarques sur la "nouvelle" physique d'Averroès", *Arabic Sciences and Philosophy* 21 (2), 2011, pp. 299-318) insists on arguing that the Anaxagorean model of generation referred to by Aristotle in *Physics* I.4 is that of alteration, rather than of segregation, relying extensively on a text from *De generatione et corruptione* I.1, especially 314a6 ff. In this passage, Aristotle criticises Anaxagoras for not having grasped the proper meaning of 'generation', which should be the reason why he assimilated generation to alteration (the idea that Anaxagoras used the term 'alteration' improperly, without grasping its meaning, is echoed also in Themistius' commentary on *Physics* I.4: cf. THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, 13.28-14.2). Whatever interpretation of this passage one chooses to accept, it is hard to deny that, in the context of *Physics* I.4, Aristotle characterises Anaxagoras as holding the view that generation happens by segregation. See, especially, *Physics* I.4, 187a20-23, where, in providing a classification of previous thinkers' positions on principles of nature, Aristotle claims that "The second set [of thinkers] assert that the contrarieties are contained in the one and emerge from it by segregation, for example Anaximander and also all those who assert that what is is one and many, like Empedocles and Anaxagoras; *for they too produce other things from their mixture by segregation*" (my emphasis). Cf. also, for instance, *Physics* I.4, 187b22-24, and 188a12-18.

[406] ARISTOTELES, *Physica*, I.4, 187b2-7, ed. ROSS: "[…] φαίνεσθαι δὲ διαφέροντα καὶ προσαγορεύεσθαι ἕτερα ἀλλήλων ἐκ τοῦ μάλισθ᾽ὑπερέχοντος διὰ πλῆθος ἐν τῇ μίξει τῶν ἀπείρων· εἰλικρινῶς μὲν γὰρ ὅλον λευκὸν ἢ μέλαν ἢ γλυκὺ ἢ σάρκα ἢ ὀστοῦν οὐκ εἶναι, ὅτου δὲ πλεῖστον ἕκαστον ἔχει, τοῦτο δοκεῖν εἶναι τὴν φύσιν τοῦ πράγματος." Translatio vetus, ed. BOSSIER, BRAMS, p. 19, ll. 11-16: "[…] apparere autem differentia et appellari altera ad invicem ex maxime continenti propter multitudinem in mixtura infinitorum; sincere quidem enim totum album vel nigrum aut dulce aut carnem aut os non esse, sed quod hoc plus unumquodque habet, hoc videtur esse secundum naturam rei." Translatio Vaticana, ed. MANSION, p. 10, ll. 6-10: "[…] uideri differentia et appellari diuersa ab inuicem ex maxime excedente propter multitudinem in permixtione infinitorum. Sincere namque totum album aut nigrum aut dulce aut carnem aut os non esse; quod plurimi singulum habet, uideri esse naturam rei." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 34): "[…] apparere autem differentia et

After this introductory section, Aristotle starts listing five arguments aimed at refuting the theory that the principles of nature are (numerically) infinite. The first of them, which has been already mentioned, is an epistemic one: it affirms that the infinite *qua* infinite cannot be known, and, assuming that it is possible to attain knowledge of nature (and therefore also of its principles), it is impossible that the principles of nature are infinite[407]. The fourth and the fifth one will not concern us here.

The most important argument, for what concerns the theory of *minima naturalia* is the second one discussed by Aristotle (to be read in connection with the third one). In order to fully understand it, it is important to remark that the argument is mereological in nature[408], and that it takes as a premiss the assumption that the size of the parts of a given (natural) whole must be smaller than (or at the limit equal to) that of the whole itself. The argument is presented by Aristotle in the following passage:

> Further, if the parts of a whole may be indefinitely big or small (by parts I mean components into which a whole can be divided and which are actually present in it), it is necessary that the whole thing itself may be of any size. Clearly, therefore, if it is impossible for an animal or plant to be indefinitely big or small, neither can its parts be such, or the whole will be the same. But flesh, bone, and the like are the parts of animals, and the fruits are the parts of plants. Hence it is obvious that neither flesh, bone, nor any such thing can be of indefinite size in the direction either of the greater or of the less[409].

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appellari altera ab invicem ex maxime superabundanti propter multitudinem in mixtura infinitorum. Sincere quidem enim totum album aut nigrum aut carnem aut os non esse: sed quod plus unumquodque habet, hoc videtur esse natura rei." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 22rD-E): "[…] apparere autem differentia et appellari altera ab inuicem ex eo quod maxime superabundant propter multitudinem in mistura infinitorum. Syncere enim totum album aut nigrum aut dulce aut carnem aut os non esse, sed cuius plurimum unumquodque habet, hoc videri esse naturam rei."

[407] Cf. *Physics* I.4, 187b7-13.

[408] This might seem uncommon within the framework of Aristotelian metaphysics, but it becomes natural enough once one considers that Anaxagoras' view, which Aristotle is contrasting, is fully formulated in mereological terms.

[409] ARISTOTELES, *Physica*, I.4, 187b13-21, ed. ROSS: "ἔτι δ᾽εἰ ἀνάγκη, οὗ τὸ μόριον ἐνδέχεται ὀπηλικονοῦν εἶναι κατὰ μέγεθος καὶ μικρότητα, καὶ αὐτὸ ἐνδέχεσθαι (λέγω δὲ τῶν τοιούτων τι μορίων, εἰς ὃ ἐνυπάρχον διαιρεῖται τὸ ὅλον), εἰ δὴ ἀδύνατον ζῷον ἢ φυτὸν ὀπηλικονοῦν εἶναι κατὰ μέγεθος καὶ μικρότητα, φανερὸν ὅτι οὐδὲ τῶν μορίων ὁτιοῦν· ἔσται γὰρ καὶ τὸ ὅλον ὁμοίως. σὰρξ δὲ καὶ ὀστοῦν καὶ τὰ τοιαῦτα μόρια ζῴου, καὶ οἱ καρποὶ τῶν φυτῶν. δῆλον τοίνυν ὅτι ἀδύνατον σάρκα ἢ ὀστοῦν ἢ ἄλλο τι ὀπηλικονοῦν εἶναι τὸ μέγεθος ἢ ἐπὶ τὸ μεῖζον ἢ ἐπὶ τὸ ἔλαττον." Translatio vetus, ed. BOSSIER, BRAMS, p. 20, ll. 7-16: "Amplius autem si necesse est, cuius pars contingit quantacumque esse secundum multitudinem et parvitatem, et ipsum contingere (dico autem talium aliquam partium, in quam cum insit dividitur totum), si autem inpossibile est animal aut plantam quantamcumque esse secundum magnitudinem et parvitatem, manifestum est quod neque partium quelibet; erit enim et totum similiter. Caro autem et os et huiusmodi partes sunt animalis, et fructus plantarum. Manifestum igitur quod inpossibile est carnem aut os aut aliud aliquod quantumcumque esse magnitudine aut in maius aut in minus." Translatio Vaticana, ed. MANSION,

The argument can be formulated as a *modus tollens*, which claims that if one accepts Anaxagoras' theory (more precisely, one of its implications, namely that, since everything comes to be out of everything and everything is present in everything, it is always possible to continue to extract smaller and smaller parts[410] of any x from any y, and therefore x can be of any size whatsoever), one is straightforwardly led to an impossible conclusion, so that the argument must be rejected:

1. If the parts of a whole can be of any size whatsoever in magnitude and in smallness, then the whole itself can be of any size whatsoever in magnitude and in smallness.
2. However, all animate (living) beings (plants and animals) cannot be of any size whatsoever in magnitude and in smallness (this is taken to be evident and in no need of an argument).
3. Therefore, all the (homogeneous) parts of animate beings (such as fruits for plants and bone and flesh for animals) cannot be of any size whatsoever in magnitude and in smallness (and, therefore, it is not true that everything comes to be out of everything and that everything is present in everything).

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p. 10, ll. 16-25: "Amplius autem necesse cuius partem contingit quantulamcumque esse secundum magnitudinem et paruitatem, et id contingere. Dico autem talium aliquam parcium in quam inexistentem diuiditur totum. Si uero impossibile animal aut plantam quantulumcumque esse et secundum inmensitatem et paruitatem, palam quia nec parcium quecumque. Erit enim et totum similiter. Caro uero et os et similes partes animalis et fructus plantarum. Palam ergo quia impossibile carnem aut os aut aliud quodcumque quantulumcumque esse magnitudine aut in maius aut in minus." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 34): "Amplius autem, si necesse est cuius pars contingit quantacumque esse secundum magnitudinem et parvitatem, et ipsum totum contingere (dico autem talium aliquam partium, in quam cum insit dividitur totum); si autem impossibile est animal aut planta quantamcumque esse secundum magnitudinem et parvitatem; manifestum est quoniam neque partium quamlibet; erit enim totum partibus simile. Caro autem et os et huiusmodi partes sunt animalis, et fructus plantarum. Manifestum igitur quoniam impossibile est carnem aut os aut aliquod aliud quantumcumque esse magnitudine aut in maius aut in minus." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 23vK-L): "Amplius autem, si necesse est cuius partem contingit quantulamcunque esse secundum magnitudinem et paruitatem, et ipsum contingere (dico autem talium aliquam partium in quam cum insint diuiditur totum); si autem impossibile est animal aut plantam quantamcunque esse secundum magnitudinem et paruitatem, manifestum est quod neque partium quamlibet; erit nam et totum similiter. Caro autem et os et huiusmodi partes sunt animalis, et fructus plantarum. Manifestum est igitur quod impossibile est carnem aut os aut aliquid aliud quantumcunque esse magnitudine, aut in maius aut in minus."

[410] For ease of exposition, and also considering that the thesis is only concerned with *minima* (and not *maxima*) *naturalia*, the argument is limited to the problem of the inferior limit of the size of material substances.

In order to understand the full import of the argument, it must be remarked that in it Aristotle divides material substances in two categories. On the one hand, he considers animate (living) beings, which, apart from their soul, are characterized by the fact of being non-homeomerous (i.e., their parts are different from the whole). They are what Medieval Latin commentators will normally refer to as heterogeneous material substances. On the other hand, he considers inanimate entities, and especially those that are components of animate (living) beings. They are what Medieval Latin commentators will normally refer to as homogeneous material substances. This distinction (which represents a fundamental step in the argument) needs to be especially underlined, since it will play a key role in the subsequent history of the debate on *minima naturalia*, which will mostly be devoted to the question of *minima* in homogeneous (inanimate) substances. Virtually no commentators (be they ancient or medieval) will dispute the notion that heterogeneous substances, i.e., animate (living) beings, have *minima* and *maxima*, a fact which is always taken to be an empirical evidence and also somehow implied by the understanding of a living being as an entity which needs components with different natures in order to perform its functions.

Moreover, it must be noted that the argument, as such, does not constitute a proper theory of *minima naturalia*. Indeed, taken at face value, it is an argument that could be accepted even by a philosopher who does not share Aristotle's hylomorphic theory of material substances[411]. More precisely, such an argument is constructed so as to be acceptable even within the framework of Anaxagoras' theory (this is the case also of the other four arguments discussed by Aristotle in the chapter). Indeed, as underlined above, the argument is located *before Physics* I.7, the starting point of the Aristotelian account of the principles of nature. As a consequence, it would have been difficult (and self-defeating) for Aristotle to formulate it in a way which already presupposes a hylomorphic

[411] This is all the more relevant since, starting at least with John Philoponus, this Aristotelian argument is explicitly reformulated in hylomorphic terms (cf. PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 96.27-30). Moreover, already Themistius – albeit in a tentative way – referred to form in the exposition of *Physics* I.4 (cf. THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, 14.25-26, 15.13-16 and especially 15.31-16.6) and presumably such a reference was already included in Alexander of Aphrodisias' lost commentary on the *Physics*, according to Simplicius (cf. SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*, ed. DIELS, 169.5-25). All Medieval commentators, as it will become apparent in the course of the chapter, interpret Aristotle's second argument against Anaxagoras in *Physics* I.4 as concerning the substantial forms of material substances.

account of material substances. Aristotle's purpose in *Physics* I, on the contrary, is exactly that of arriving at a hylomorphic account of material substances by showing the implausibility of possible alternatives, such as Anaxagoras' theory of infinite principles. If this is so, it is clear why the concept of form does not play any role in the argument[412]. This conclusion is extremely important for what concerns subsequent developments of debates on *minima naturalia*. Indeed, only in the context of a connected reading of Aristotle's natural treatises is it possible to understand the argument presented in *Physics* I.4 as related to the persistence through division of the substantial forms of material substances. The main consequence of the fact that Aristotle does not appeal to the concept of form in the present argument is that this is not an argument which concerns (at least explicitly) the persistence conditions of the substantial forms of material substances. It is obviously easy to read it in this way, though, since nothing in principle prevents one from doing so, from the point of view of an *already accepted* hylomorphic account of material substances.

It is now time to turn to the third argument against Anaxagoras presented in *Physics* I.4. As mentioned above, the third argument presented by Aristotle against Anaxagoras' theory is also concerned with *minima naturalia*. More precisely, at the beginning Aristotle rephrases his argument in favour of the existence of *minima naturalia* and he extends it to all material substances:

> […] hence, since every finite body[413] is exhausted by the repeated abstraction of a finite body, it is evident that everything cannot subsist in everything else. For let

[412] Indeed, reference to 'form' (εἶδος) in the first three chapters of *Physics* I occurs only three times, all in the same passage, concerning a criticism of Melissus (cf. *Physics* I.3, 186a19-22). In that context, however, the term is used only in a generic (i.e., non-Aristotelian) way. At the beginning of *Physics* I.4 (187a12-20) moreover, Aristotle talks of 'form' while referring to Platonic ideas and the philosophers (not univocally identified) which are linked to his position. It is noteworthy, in any case, that none of these passages provides even a tentative definition of 'form', a task which is left for Aristotle's own account of the principles of nature, starting with *Physics* I.7.

[413] The reference to 'body', σῶμα, is of the utmost importance in order to understand the argument correctly. In his recent monograph (PFEIFFER, *Aristotle's Theory of Bodies*, *op. cit.*), already discussed in the previous chapter, Christian Pfeiffer distinguishes between three different meanings of the word 'body' as used by Aristotle (i.e., body as quantity, body as substance, and body as matter). Indeed, based on the interpretation of this notion one provides, the argument might, or might not, be amenable to a discussion of the limits of division of material substances. Interestingly, as it will be shown below, while Themistius (cf. THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, 15.31-16.6) interprets it as merely meaning 'quantity', Simplicius, in his commentary on *Physics* I.4, 187b13, understands σῶμα as opposite to ὕλη, and he interprets the former as referring to a substance composed of both matter and form, whereas the latter refers to matter only. Based on this argument, Simplicius allows infinite divisibility for ὕλη, but denies it for σῶμα, thus contributing to a crucial reformulation of Aristotle's arguments in *Physics* I.4 in

> flesh be extracted from water and again more flesh be produced from the remainder by repeating the process of separation; then, even though the quantity separated out will continually decrease, *still it will not fall below a certain magnitude*[414].

The emphasised statement clearly assumes as a premiss the demonstration that material substances have a *minimum naturale*, as established in the course of the previous argument. However, it is important to remark that, at the beginning of the passage quoted, Aristotle seems to be providing a partially independent argument for the existence of *minima naturalia* in all material substances. Indeed, here Aristotle notices that every body has the property of being (quantitatively) finite. If this is so, the quantity of matter which composes it is limited and, as a consequence, it is not possible to continue to extract quantities of other substances from it *ad infinitum*. Therefore, contrary to what Anaxagoras claims, it is not true that everything comes to be out of everything and that everything is present in everything. Schematically, the argument could be presented as follows:

1. Every body is (quantitatively) finite.
2. A body is quantitatively finite if and only if the quantity of matter which composes it is limited.
3. If the quantity of matter composing a body is limited, then it is impossible to keep reducing it *ad infinitum*.

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hylomorphic terms (cf. SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*, ed. DIELS, 229.17).

[414] ARISTOTELES, *Physica*, I.4, 187b25-30, ed. ROSS: "[...] ἅπαν δὲ σῶμα πεπερασμένον ἀναιρεῖται ὑπὸ σώματος πεπερασμένου, φανερὸν ὅτι οὐκ ἐνδέχεται ἐν ἑκάστῳ ἕκαστον ὑπάρχειν. ἀφαιρεθείσης γὰρ ἐκ τοῦ ὕδατος σαρκός, καὶ πάλιν ἄλλης γενομένης ἐκ τοῦ λοιποῦ ἀποκρίσει, εἰ καὶ ἀεὶ ἐλάττων ἔσται ἡ ἐκκρινομένη, *ἀλλ'ὅμως οὐχ ὑπερβαλεῖ μέγεθός τι τῇ μικρότητι*" (my emphasis). Translatio vetus, ed. BOSSIER, BRAMS, p. 20, l. 20-p. 21, l. 4: "[…] omne autem corpus finitum reinciditur a corpore finito, manifestum est quod non contingit in unoquoque unumquodque esse. Remota enim ex aqua carne et iterum alia facta ex reliqua, segregabit, quamvis et semper minor erit segregata, *sed tamen non excellit magnitudo aliquam parvitatem*." Translatio Vaticana, ed. MANSION, p. 10, l. 29.p. 11, l. 4: "[…] omne uero corpus finitum aufertur a corpore finito, palam quia non contingit in unoquoque unumquodque inesse. Ablata namque ab aqua carne et iterum alia genita de reliquo decretione, quamquam semper minor fuerit secreta, *tamen non excedit mensuram aliquam paruitate*." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 34): "[…] omne autem corpus finitum resecatur a corpore finito: manifestum est quod non contingit in unoquoque unumquodque esse. Remota enim ex aqua carne, et iterum alia facta ex reliqua segregatione, quamvis semper minor erit segregata, *sed tamen non excellit magnitudo aliquam parvitatem*." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 24rF-24vG): "[…] omne autem corpus finitum consumitur a corpore finito: manifestum est quod non contingit in unoquoque unumquodque esse. Remota nam ex aqua carne, et iterum alia facta ex reliqua segregation, quamuis semper minor erit segregate, *at tamen non excedit magnitudinem aliquam paruitate*."

4. Therefore, no body can be reduced *ad infinitum* (and it is not the case that everything comes to be out of everything and that everything is present in everything).

Aristotle states his conclusion in the following passage:

> If, therefore, the process comes to an end, everything will not be in everything else (for there will be no flesh in the remaining water); if on the other hand it does not, and further extraction is always possible, there will be an infinite multitude of finite equal parts in a finite quantity – which is impossible[415].

The most important feature of the argument is, of course, the notion of 'body'. Indeed, without invoking the notion of material substance as a hylomorphic compound of matter and substantial form, if 'body' is taken to be coreferential with 'material substance' as understood by Aristotle (as the argument seems to assume), it might be said that here Aristotle is providing a *non-hylomorphic* argument against the (potential) infinite divisibility of material substances, one which, once again, however, it was easy for Late Ancient and Medieval commentators to reinterpret in hylomorphic terms.

It must be noted, furthermore, that a final passage of the argument (sometimes interpreted as an autonomous and separated argument[416]) provides still another formulation relevant to *minima naturalia* (cf. *Physics* I.4, 187b35-188a2). However, since

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[415] ARISTOTELES, *Physica*, I.4, 187b30-34, ed. ROSS: "ὥστ᾽εἰ μὲν στήσεται ἡ ἔκκρισις, οὐχ ἅπαν ἐν παντὶ ἐνέσται (ἐν γὰρ τῷ λοιπῷ ὕδατι οὐκ ἐνυπάρξει σάρξ), εἰ δὲ μὴ στήσεται ἀλλ᾽ἀεὶ ἕξει ἀφαίρεσιν, ἐν πεπερασμένῳ μεγέθει ἴσα πεπερασμένα ἐνέσται ἄπειρα τὸ πλῆθος· τοῦτο δ᾽ἀδύνατον." Translatio vetus, ed. BOSSIER, BRAMS, p. 21, ll. 4-8: "Quare si quidem stabit segregatio, non omne in omni inerit; in reliqua autem aqua non inerit caro; si vero non stabit sed semper habebit remotionem, in finita magnitudine equalia finita inerunt infinita secundum magnitudinem; hoc autem inpossibile est." Translatio Vaticana, ed. MANSION, p. 11, ll. 4-8: "Ergo si stat secretio, non omne in omni inerit. In reliqua enim aqua non inerit caro. Quodsi non steterit sed semper ablationem habuerit, in finita magnitudine inerunt infinita secundum multitudinem. Sed hoc inpossibile." Translatio Guillelmi (in THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, ed. MAGGIOLO, p. 34): "Quare, si quidem stabit segregatio, non omne in omni inerit: in reliqua enim aqua non inerit caro. Si vero non stabit, sed habebit semper remotionem, in finita magnitudine aequalia finita inerunt infinita secundum multitudinem: hoc autem impossibile est." Translatio Scoti (in AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 24vG): "Quare, si quidem stabit segregatio, non omne in omni inerit: in reliqua nam aqua non inerit caro. Si vero non stabit, sed habebit semper remotionem, in finita magnitudine aequalia finita inerunt infinita secundum multitudinem: hoc autem impossibile est."

[416] Among late ancient commentators, both Philoponus and Simplicius explicitly identify the passage with an autonomous Aristotelian argument against Anaxagoras (cf. PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 105.26-106.4, and SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*, ed. DIELS, 171.13-27).

the passage clearly assumes as true that homogeneous substances (such as flesh) are limited both in terms of greatness and smallness (supposedly on the strength of the second argument discussed by Aristotle against Anaxagoras), I will not discuss it further[417].

There is one last Aristotelian passage that, although not concerned with *minima naturalia*, will play a significant role in Medieval discussions on the issue. It is the first part of *De sensu et sensato* 6 (445b3-446a20). The text represents the Aristotelian source of the separate problem of *minima sensibilia*, the main topic of the present thesis. As such, the passage will be analysed at length in the following chapter of the work. However, since it also played a fundamental role in the development of the Medieval debate on *minima naturalia*, it seems better to briefly recall it here. In the first part of *De sensu* 6, Aristotle discusses the problem of the divisibility of sensible qualities according to the division of the matter of the substances in which they inhere as accidental forms[418]. Aristotle claims that, while sensible qualities are in potency infinitely divisible according to their matter, in act they cannot subsist on their own beyond a certain *minimum*. Once the threshold has been surpassed, the quantity of matter concerned loses its sensible qualities and acquires that of the containing medium:

> […] we must take account of the difference between the potential and the actual. […] because they [i.e., extremely small portions of matter] are only potentially not actually visible, unless when they have been parted from the wholes. So the foot-length too exists potentially in the two foot-length, but actually only when it has been separated from the whole. But increments so small might well, if separated from their totals, be dissolved in their environments, like a drop of sapid moisture poured out into the sea[419].

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[417] However, it must be noted that the passage has a fundamental importance in the late ancient and medieval commentary tradition on *minima naturalia*, since it is the only passage of *Physics* I.4 that mentions a "minimal quantity of flesh" (or "*minimum* of flesh"), providing then the main expression under which the existence and nature of *minima naturalia* will be debated, especially in the Latin world, where the discussions on *minima naturalia* will frequently be put under the heading of the question about the existence of a *minima caro* and, correlatively, the fact that it is not possible to give something that is *minus minimo* (cf. *infra* the following sections of the chapter).

[418] To be precise, Aristotle also discusses the problem of the formal divisibility of sensible qualities into species, what I call the issue of the *numerus sensibilium*, an issue which does not need to concern us here, and that will be addressed, whenever relevant, in the course of Chapter 3 and 4, dealing directly with Medieval commentaries on *De sensu* 6, 445b3-446a20.

[419] ARISTOTELES, *De sensu* 6, 445b30; 446a2-9 (ARISTOTLE, *Parva naturalia. A Revised Text with Introduction and Commentary*, ed. W.D. ROSS, Oxford, Clarendon Press, 1955): "ληπτέον ὅτι τὸ δυνάμει καὶ τὸ ἐνεργείᾳ ἕτερον [...] δυνάμει γὰρ ὁρατά, ἐνεργείᾳ δ᾽οὔ, ὅταν μὴ χωρὶς ᾖ· καὶ γὰρ ἐνυπάρχει δυνάμει ἡ ποδιαία τῇ δίποδι, ἐνεργείᾳ δ᾽ἤδη ἀφαιρεθεῖσα. χωριζόμεναι δ᾽αἱ τηλικαῦται ὑπεροχαὶ εὐλόγως μὲν ἂν καὶ διαλύοιντο εἰς τὰ περιέχοντα, ὥσπερ καὶ ἀκαριαῖος χυμὸς εἰς τὴν θάλατταν ἐγχυθείς." Translatio vetus (the text of the *translatio vetus* is quoted according to the one available in the Aristoteles Latinus Database: ARISTOTELES LATINUS, *De sensu et sensato. Translatio anonyma (Aristoteles Latinus XIII.1)*, ed. L.

The passage quoted is very straightforward and exhaustive in its explanation of the complex interaction between potency and act in the case of the division of sensible qualities (thus, accidental forms) through thedivision of the matter of the material substances in which they inhere. It is no wonder, then, that a significant portion of medieval commentators will rely on *De Sensu* 6 when explaining the Aristotelian theory of *minima naturalia*, as the following sections will clearly show. It is now time to turn to Aristotelian commentators and to follow, from late antiquity up to the end of the 14th century, the progressive emergence and subsequent developments of the theory of *minima naturalia*.

2.3. *Minima naturalia* in Late Ancient Aristotelian Commentators: The Emergence of the Hylomorphic Interpretation of *Physics* I.4

2.3.1. Themistius

The first of them, in chronological order, is certainly Themistius, as already explained in the previous chapter. The first step in Themistius' analysis consists in a restatement of Aristotle's second argument against Anaxagoras, the one discussed in *Physics* I.4, 187b13-21. As already noted, and as accepted also by Themistius, the passage argues for the existence of *minima naturalia* in inanimate homogeneous substances, such as flesh and bones, insofar as they components of animate beings (animals and plants), whose size is necessarily limited both in greatness and in smallness:

PEETERS, available online at Aristoteles Latinus Database, URL <http://apps.brepolis.net/LTool/Entrance.aspx?w=9&a=%2fald%2fDefault.aspx>, last consulted on January 31st, 2023): "sumatur autem quod virtute et actione aliud [...] virtute namque visibilia, actione vero non, quando separata non sunt. Etenim inest virtus gressibilis bipedi actione separata. Separatis igitur tunc superhabundantiis rationabiliter et resolvuntur in continentia, velud subtilis chimus mari infusus." Translatio nova (the text of the *translatio nova* is quoted according to the one edited in THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia (Sancti Thomae de Aquino Opera Omnia, Editio Leonina, Tomus XLV.2)*, ed. R.-A. GAUTHIER, Roma-Paris, Commissio Leonina-Vrin, 1986; the text of *De sensu* 6, 445b3-446a20 is entirely on p. 76): "sumendum quia quod potencia et quod actu aliud […] potencia namquae visibilia ipsa, actu autem non, quando non separaverit; et enim inest potencia que pedalis bipedi, actu itaque divisa. Separate autem tante superhabundancie rationabiliter quidem utique et resolvuntur in continencia, velud minimus sapor mari infusus." On the important differences between the two Latin translations, and especially on their effect on the Medieval Latin debate on *minima naturalia*, see below in this same chapter.

> That this is impossible [the existence of material substances without limit in greatness and in smallness] is clear from its being agreed that [1] every compound consists of parts (I mean of parts such that they can also be actually separated from one another and from the whole), and [2] the whole in terms of its size is a consequence of its parts (e.g., if the parts are small, the whole is small too; but if they are large, it is large too), and [3] if the progression involving the parts is without limit in both directions, then it is also without limit for the compound. Also, <if> flesh, sinews and bones of any size can come to be, then, of course, so too can an animal; and if the parts of a plant, then the plant itself too. And thus the converse is similarly true: that if the whole cannot come to be, neither can the parts. And the sizes of both animals and plants even according to Anaxagoras himself are also determinate[420]; so too therefore are those of their parts. And it is impossible for a human being's flesh to be of any size so that the flesh that co-exists with innumerable other things in a tiny space can consequently be further minimized while still being flesh[421]. That, after all, is astonishing[422].

The passage, as it is clear even at a first reading, follows closely Aristotle's formulation and, as a result, it formulates the argument for limits to the size of living beings and, as a

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[420] This does not emerge from any of the extant fragments of Anaxagoras, and it is rather difficult to reconcile this view with Anaxagoras' notion that the seeds of living beings are present in the "extreme mixture" (using Marmodoro's terminology) of all the principles, since the principles in the mixture are by definition infinitely divided. However, it seems more probable to me that Themistius is rather affirming that the fact that animals and plants exist only within a finite range of sizes is a fact evident to everybody and therefore something that also Anaxagoras should admit.

[421] Literally, Aristotle uses the expression ἐν κέγχρῳ, 'in a millet-seed', as noted by Todd, the editor and translator of the English version of Themistius' commentary. The expression is clearly meant to stand for the "smallest imaginable thing" (cf. THEMISTIUS, *On Aristotle* Physics *1-3*, TODD (trans.), *op. cit.*, p. 125, n. 193). However, Todd is in my view mistaken to think that Themistius takes the expression from *Physics* IV.12, 221a22-23, where Aristotle refers to "the heavens in a millet-seed" in what, even by Todd's admission, is an argument totally unrelated to the present passage. It is much more likely to think that the expression is drawn from *De sensu* 6, 445b30-31 where, discussing the notion of the infinite parts potentially contained in a given whole, Aristotle takes the example of a grain of millet and notes that: "It is owing to this difference [between the potential and the actual] that we do not see its ten-thousandth part in a grain of millet, although sight has embraced the whole grain within its scope […]" (cf. Chapter 3 for the complete text of this passage). The passage is obviously much more relevant to the argument of *Physics* I.4 and this reference makes it likely that Themistius was commenting on *Physics* I.4 by keeping into consideration the text of *De sensu* 6. The same reference to the millet-seed can be found in Philoponus' commentary on the *Physics* (cf. PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 103.10-11) and a similar one to a grain of millet can also be found in Simplicius' *Physics* commentary (cf. SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*, ed. DIELS, 167.4). Both references have probably been directly derived from Themistius. Still, this fact attests to the importance of the text of *De sensu* 6 already in Late Ancient discussions of the issue of *minima naturalia*.

[422] THEMISTIUS, *On Aristotle* Physics *1-3*, TODD (trans.), *op. cit.*, pp. 32-33. For the Greek text see THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, 14.31-15.9: "ὅτι δὴ τοῦτο ἀδύνατον, ἐντεῦθεν φανερόν. ὁμολογεῖται μὲν γὰρ ἅπαν τὸ σύνθετον ἐκ μερῶν· ἐκ μερῶν δὲ λέγω τοιούτων ἃ καὶ χωρισθῆναι δύναται κατ᾽ἐνέργειαν ἀλλήλων τε καὶ τοῦ ὅλου, καὶ τὸ ὅλον τοῖς μέρεσιν ἀκολουθεῖν κατὰ τὸ μέγεθος, οἷον εἰ μικρὰ τὰ μέρη, μικρὸν τὸ ὅλοω· εἰ μεγάλα ἐκεῖνα, μέγα καὶ τοῦτο, καὶ εἴ γε εἰς ἄπειρον ἐπ᾽ἐκείνων ἡ πρόδος ἐπ᾽ἀμφότερα, ἐπ᾽ἄπειρον εἶναι καὶ τοῦ συνθέτου· καὶ <εἰ> σάρκα καὶ νεῦρα καὶ ὀστᾶ ὁπηλικαοῦν γίνεσθαι δυνατόν, ἐνδέχεται δήπου καὶ ζῷον· καὶ εἰ τὰ μέρη τοῦ φυτοῦ, καὶ αὐτὸ τὸ φυτόν· καὶ τὸ ἀντιστρέφον τοίνυν ὁμοίως ἀληθές, εἰ μὴ δυνατὸν τὸ ὅλον, οὐδὲ τὰ μέρη. ὥρισται δὲ τὰ μεγέθη τῶν τε ζῴων καὶ τῶν φυτῶν καὶ κατ᾽αὐτὸν Ἀναξαγόραν· ὥρισται ἄρα καὶ τῶν μορίων καὶ οὐκ ἐνδέχεται ὁπηλικηνοῦν εἶναι σάρκα ἀνθρώπου, ὡς δύνασθαι καὶ τὴν ἐν κέγχρῳ μετὰ παμμυρίων ἄλλων ὑπάρχουσαν ἔτι καθαιρεῖν ἐπὶ τὸ ἔλαττον οὖσαν ἔτι σάρκα· τοῦτο γὰρ θαυμαστόν."

consequence, for their parts, in "mereological" (or, however, non-hylomorphic) terms. This is not to say that Themistius does not give any role to form in his discussion[423]. On the contrary, it is clear to Themistius that, in order to fully refute Anaxagoras' theory, Aristotle's argument must be made more explicit and applied equally to any substance considered "in isolation", so to speak, and not relying only on the case of living beings. It is at this critical juncture[424] that Themistius, in order to achieve this aim, introduces the reference to forms in the "theory" of *minima naturalia*:

> In general, minimising flesh [like any other material substance] without limit no longer involves preserving (φυλάττειν) flesh, since while it is not impossible to think of the sub-division of body (σῶμα) without limit, it is entirely inconceivable to do so for flesh (σάρξ), given that the small bit (τὸ σαρκίον)[425] of flesh quickly ceases to be. But I am not aware that Anaxagoras can agree since, according to him, the principles cannot cease to be. So if what we are saying is true and the size of the least amount of flesh is finite, then necessarily it is impossible that everything is mixed with each thing. Why so? Because every body of finite size, even if miniscule things of finite size were removed from it, would still at some point be depleted (ἐπιλείψειέ)[426].

[423] Apart from the passage discussed below, Themistius also refers to 'form' (εἶδος) in discussing the first Aristotelian argument against Anaxagoras (which is not directly relevant to the debate on *minima naturalia*), the one claiming that the infinity of the principles determines the impossibility to know them and therefore to have knowledge of nature, an utterly unacceptable conclusion. Themistius notes, in particular, that Anaxagoras admits not only a quantitative infinity of each principle, but also a qualitative infinity concerning the number of principles differing in form (εἶδος) (cf. THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, 14. 25-26).

[424] The passage is already part of the commentary by Themistius on the third argument provided by Aristotle against Anaxagoras' theory (cf. *Physics* I.4, 187b22-188a2). Nevertheless, it is much more correct to interpret it as the natural conclusion of the preceding discussion, concerned with Aristotle's second argument, rather than as the beginning of a new discussion. Indeed, the following passages clearly restate Aristotle's third argument without adding much to it.

[425] Todd translates this expression as "micro-unit" of flesh (cf. also THEMISTIUS, *On Aristotle* Physics *1-3*, TODD (trans.), *op. cit.*, p. 125 n. 195 p. 126 nn. 197 and 202, and p. 127 n. 219). While such a translation has the obvious advantage of making clear that Themistius is referring to a very small part of flesh, it is not warranted by the text: indeed, when Themistius wants to refer to the "micro-units" of flesh, he does not hesitate to employ the more precise expression ἡ ἐλαχίστη σάρξ, as he does a few lines below in the passage quoted. By contrast, here he refers generically to small portions of flesh, without any hints to the fact that they are the minimal units of flesh or their ultimate component. Such a development, while evident in Philoponus, as will be shown in the following pages, is far from Themistius' "pioneering" analysis of *minima naturalia*, and as such it risks projecting Philoponean concepts onto an earlier (and far less "creative", at least on this issue) commentator.

[426] THEMISTIUS, *On Aristotle* Physics *1-3*, TODD (trans.), *op. cit.*, p. 33. For the Greek text see THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL 15.31-16.6: "ὅλως δὲ τὸ καθαιρεῖν ἐπ᾽ἄπειρον σάρκα οὐδὲ σάρκα ἔτι φυλάττειν ἐστίν· ὡς μὲν γὰρ σώματος οὐκ ἀδύνατον ἐπ᾽ἄπειρον νοεῖσθαι τὴν τομήν, ὡς δὲ σαρκὸς ἀμήχανον παντελῶς· διαφθείρεται γὰρ οὐκ εἰς μακρὸν τὸ σαρκίον. Τοῦτο δὲ οὐκ οἶδα προσομολογούμενον Ἀναξαγόρᾳ· ἄφθαρτοι γὰρ κατ᾽αὐτὸν αἱ ἀρχαί. Εἰ δὴ ταῦτα ἀληθῆ λέγομεν, καὶ τὸ μέγεθος ὥρισται τῆς ἐλαχίστης σαρκος, ἀναγκαίως ἀδύνατον ἐν ἑκάστῳ πάντα μεμῖχθαι. τί δήποτε; ὅτι πᾶν σῶμα πεπερασμένον, εἰ καὶ σμικρότατα ἀπ᾽αὐτοῦ πεπερασμένα ἀφαιροῖτο, ὅμως ἐπιλείψειέ ποτε."

Although Themistius does not explicitly formulate his argument in hylomorphic terms, it is clear by the dichotomy he institutes between body (σῶμα) and flesh (σάρξ) that this is the correct reading of his argument. Whereas a body, as a mere quantity of matter, can be infinitely divided, a material substance like flesh, once it has reached its *minimum*, cannot be further divided. If one attempted to do so, indeed, the flesh would "quickly cease to be", that is to say, only extremely small bits of matter would survive the division, deprived of their own substantial form. Therefore, at the end of his discussion of the main Aristotelian argument for the existence of *minima naturalia* in *Physics* I.4, Themistius abandons the mereological perspective adopted by Aristotle and shifts to a hylomorphic framework, thus paving the way to the approach to Aristotelian *minima naturalia* which will be expressed in a full-fledged theory by later ancient commentators such as Simplicius and Philoponus, according to whom, as mentioned above, the very notion of 'body' used in the Aristotelian argument would be interpreted as referring to hylomorphic material substances.

2.3.2. Philoponus

Among them, John Philoponus certainly occupies the most important place. What could be called the 'hylomorphic turn' in the understanding of Aristotle's arguments in *Physics* I.4, which, as seen above, were originally formulated in mereological terms, appears to be a *fait accompli* in Philoponus' commentary[427]. This is clear from the outset of his exposition of Aristotle's second argument (187b13-21):

[427] Philoponus himself recognises, nevertheless, that Aristotle was not talking about form and matter in *Physics* I.4. See especially the following passage, devoted to the textual analysis of the second argument provided by Aristotle against Anaxagoras (especially 187b15): "[…] so that no one should take him [Aristotle] to mean by 'parts of the whole' the matter and the form, since he said 'of which a part can be of any size whatever'. For this reason Aristotle says 'I mean parts such that they subsist in themselves even after division from the whole, or which by being divided do not destroy the whole', neither of which applies to the form and the matter; for when the matter and the form are separated neither is the whole still preserved nor are they capable of subsisting in themselves. Nor are these *parts* of the composite but *elements*, so that one would not speak of them being 'divided' from it; for 'dividing' is the term used for parts, but 'analysis' for elements" (PHILOPONUS, *On Aristotle* Physics *1.4-9*, OSBORNE (trans.), *op. cit.*, pp. 48-49; for the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 104.18-25; my emphasis), "[…] ἵνα μή τις ὑπολάβῃ μόρια αὐτὸν λέγειν τοῦ ὅλου τὴν ὕλην καὶ τὸ εἶδος. Διὰ τοῦτό φησιν ὅτι ταῦτα λέγω τὰ μόρια ἅτινα καὶ μετὰ τὴν διαίρεσιν τὴν ἐκ τοῦ ὅλου καθ᾽ἑαυτὰ ὑφέτηκεν, ἤγουν διαιρεθέντα οὐ φθείρει τὸ ὅλον, ὧν οὐδέτερον τῷ εἴδει καὶ τῇ ὕλῃ ὑπάρχει· χωρισθεῖσα γὰρ ἡ ὕλη καὶ τὸ εἶδος οὔτε τὸ ὅλον σῴζει ἔτι, οὔτε καθ᾽ἑαυτὰ ὑποστῆναι δύναται. ταῦτα δὲ οὐδὲ μόριά ἐστι τοῦ συνθέτου, ἀλλὰ στοιχεῖα, διὸ οὐδὲ διαιρεῖσθαι ἂν λέγοιτο αὐτοῦ· διαίρεσις μὲν γὰρ ἐπὶ τῶν μορίων λέγεται, ἀνάλυσις δὲ ἐπὶ τῶν στοιχείων."

> The second objection is factual[428]. Aristotle adopts an axiom of the following sort: all the forms naturally subsist in some finite quantity, and do not naturally grow to just any size, nor naturally shrink to just any smallness, but there is a limit both to the greater and to the smaller, beyond which the form cannot exist[429].

This passage is crystalline in its meaning, and as such even more important for the present thesis. Indeed, Philoponus explicitly formulates Aristotle's second argument as an "axiom" expressing a persistence condition for the substantial forms of material substances: beyond certain inferior and superior limits to the quantity of matter to which a form is united, the form itself cannot persist. This, therefore, is the earliest formulation of what I will call, later in the chapter, the doctrine of *minima naturalia secundum formam*, that is, a doctrine according to which substantial forms metaphysically determine the minimal and the maximal quantity of matter which they can inform[430]. Moreover, Philoponus makes clear that his axiom concerns all forms, both of animate and inanimate beings, and the fact that Aristotle's argument is concerned only with the former is simply due to the fact that "the reasoning is clearer (σαφέστερος) in relation to these, as they are more distinct (τρανεστέροις)"[431].

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[428] The adjective 'factual', 'based on the facts' (πραγματειώδης, -ες) is used here as opposite to logical, as was the first argument provided by Aristotle against Anaxagoras (i.e., the one concerned with the unknowability of an infinite number of principles; cf. PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 96.4-25). The distinction is important insofar as Philoponus wants to underline, since the beginning of his discussion of *minima naturalia*, that this issue is a thoroughly *physical* one, not a purely logical (or mathematical) concern. Obviously, one should refrain from interpreting 'factual' in a modern fashion as 'empirical', or 'verifiable by experience'. What Philoponus means is rather clearer from a synonymous formula which he uses a few lines earlier: 'factual', for him, means "based on the nature of the facts [concerned]", "ἐκ τῆς φύσεως τῶν πραγμάτων" (*ibid.*, 96.9, and, for the English translation, PHILOPONUS, *On Aristotle* Physics *1.4-9*, OSBORNE (trans.), *op. cit.*, p. 40).

[429] PHILOPONUS, *On Aristotle* Physics *1.4-9*, OSBORNE (trans.), *op. cit.*, p. 41. For the Greek text, see PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 96.26-30: "Τοῦ δὲ δευτέρου ἐπιχειρήματος πραγματειώδους ὄντος προλαμβάνει ἀξίωμά τι τοιοῦτον· τὰ εἴδη πάντα, φησίν, ἐν ὡρισμένῳ τινὶ ποσῷ πέφυκεν ὑφίστασθαι, καὶ οὔτε κατὰ μέγεθος εἰς ὁτιοῦν πέφυκεν αὔξεσθαι οὔτε ἐπὶ σμικρότητα εἰς ὁτιοὺν πέφυκε μειοῦσθαι, ἀλλ᾽ἔστι τις ὅρος ἐπί τε τὸ μεῖζον καὶ ἐπὶ τὸ ἔλαττον, οὗ ἐπέκεινα ὑπάρξαι τὸ εἶδος οὐ δύναται."

[430] This last consideration is also evident by comparing Philoponus' commentary on the *Physics* to that on *De generatione et corruptione*, which, as said in the previous chapter, is the only fully extant late ancient commentary on the Aristotelian treatise. In the commentary on *De generatione* I.10, especially to 328a23-28, Philoponus claims that forms require a certain quantity of matter in order to exist, making, what is more, a reference to the *Physics*, evidently aimed at *Physics* I.4 (cf. PHILOPONUS, *Ioannis Philoponi in Aristotelis libros De generatione et corruptione* commentaria, ed. VITELLI, 198.18-19: "δεῖται γὰρ τὰ εἴδη καὶ ποσοῦ τινος, ἵνα συστῇ, ὡς αὐτὸς ἐν τῇ Φυσικῇ εἶπεν").

[431] PHILOPONUS, *On Aristotle* Physics *1.4-9*, OSBORNE (trans.), *op. cit.*, p. 41. For the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 97.1-2: "ἐν τούτοις γὰρ ὡς τρανεστέροις σαφέστερος ὁ λόγος".

Nevertheless, Philoponus thinks that the case of human beings especially allows him to formulate an argument in support of his axiom:

> The form of human being can, on the one hand, occupy a size of one cubit, while on the other hand it can also occupy four or five cubits; it cannot, however, increase indefinitely (ἐπ᾽ἄπειρον αὔξεσθαι). For no human being would reach a hundred cubits, or a size equal to the world. It is not a notional (ἐν ἐπινοίᾳ) human being that we are considering, but a real (ἐν ὑπάρξει) one[432]. It is clear that this cannot grow to some huge size above everything, but that there is some finite size beyond which it cannot grow. *Forms stretched over a huge material base (ὑποκείμενον) become attenuated (ἐξίτηλα)*[433].

The reference to the attenuation of form represents, probably, the most original feature of Philoponus' argument[434]. Indeed, it is clear that no material substance can extend to "a size equal to the world". This appeal to "common sense" and everyday observation,

[432] This remark is akin to the previous one about the 'factual' nature of the argument concerning the existence of *minima naturalia* which is under discussion (cf. PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 96.9; 26).

[433] PHILOPONUS, *On Aristotle* Physics *1.4-9*, OSBORNE (trans.), *op. cit.*, p. 41. For the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 97.2-9: "τὸ τοῦ ανθρώπου εἶδος δύναται μὲν <ἐν> πηχυαίῳ μεγέθει συστῆναι, δύναται δὲ καὶ ἐν τετραπήχει ἢ πενταπήχει, οὐ μέντοι ἐπ᾽ἄπειρον αὔξεσθαι δύναται. οὐ γὰρ δὴ καὶ ἑκατοντάπηχος γένοιτ᾽ἂν ὁ ἄνθροπος, καὶ ἴσος τοῦ κόσμου τῷ μεγέθει· οὐ γὰρ τὸν ἐν ἐπινοίᾳ ἄνθρωπον λαμβάνομεν, ἀλλὰ τὸν ἐν ὑπάρξει. τοῦτον οὖν δῆλον ὅτι ἀδύνατον ἐπὶ πολύ τι μέγεθος καὶ ὑπὲρ τὸ πᾶν αὔξεσθαι, ἀλλ᾽ἔστι τι ὡρισμένον μέγεθος, οὗ ἐπέκεινα αὐξηθῆναι οὐ δύναται· τὰ γὰρ εἴδη ἐπὶ πολύ τι ὑποκείμενον διιστάμενα ἐξίτηλα γίνεται" (my emphasis).

[434] For an assessment of this aspect, cf. J. MCGINNIS, "A Small Discovery. Avicenna's Theory of *Minima Naturalia*", *Journal of the History of Philosophy* 53 (1), 2015, pp. 1-24, esp. pp. 5-8. McGinnis rightly points out that such a reference to the "attenutation" of substantial form might be seen as implying that Philoponus held a sort of theory of the intension and the remission of substantial forms, namely, the idea that substantial forms come in degrees of intensity (the issue of the intension and remission of accidental forms, as stated in the general Introduction, will be mentioned in the following chapters of the thesis, in connection with commentaries on *De sensu* 6, and, especially, of the issue of the *numerus sensibilium*). Since, however, this is an isolated passage in the Philoponean *corpus*, and there are no other apparent references to the "attenuation" of substantial forms (McGinnis refers to a passage of Philoponus' commentary on *De generatione* I.10, namely, PHILOPONUS, *Ioannis Philoponi in Aristotelis libros De generatione et corruptione* commentaria, ed. VITELLI, 192.10-14, but there, however, the terminology is different and the reference to the "reduction" of substantial forms is part of the extremely complex issue of determining how the forms of the elements are present in a true mixture), I do not think that Philoponus is here hinting at a theory of the intension and remission of substantial forms, or, at the very least, that there is not enough evidence to support such a view. Instead, my hypothesis is that Philoponus is consciously choosing here a term outside of standard philosophical lexicon in order to convey an idea (that of the corruption of substantial forms below a certain threshold of smallness of the matter they inform) that does not have a precedent in the philosophical tradition. Indeed, the adjective ἐξίτηλος, -ον does not normally occur in previous philosophical texts (the most notable exception being an occurrence in Plato's *Republic* 497b4, concerning the progressive disappearance of philosophers' faculties in consequence of their having to live in a πὸλις with an inadequate constitution). Rather, it is employed by Philoponus in a figurative way, by analogy to its normal usage in connection with, for instance, painted figures losing their colour (cf., for instance, Xenophon's *Oeconomicus* X.3) or memories being forgotten due to the passing of time (cf. for instance Herodotus' *Historiae*, I.1).

according to Philoponus, might help in establishing not only the existence of *maxima naturalia*, but also that of *minima naturalia*:

> So then, just as it is impossible for the forms to subsist (ὑπάρξαι) in any size as regards increasing size, so it is likewise regarding reduction in size[435].

The argument presented by Philoponus seems to represent, at first glance, an inference appealing to a principle of symmetry in material substances. According to this interpretation, it could then be reformulated as follows:

1. In material substances, what is true concerning increase in size is also true of descrease in size, and viceversa.
2. There are limits to the increase in size of material substances.
3. Therefore, there must also be limits to the decrease in size of material substances.

Nevertheless, the argument, so formulated, is theroretically unsound, since premiss 1 is clearly false. Indeed, if increase in size of a material substance implies an attenuation of its substantial form, on the contrary decrease in size should imply a *concentration* of the form itself. If this is so, it is hard to see what symmetry could be found between the two cases, which, rather, seem to be opposite.

The fact that the argument in this formulation is so clearly unsound might make one question whether this is its correct interpretation at all, especially considering that it is employed by a philosopher of the calibre of Philoponus. Indeed, I think that a more correct reading of the passage would be to take this not as a demonstrative argument, but rather as a mere rhetorical illustration of Philoponus' axiom, namely, of the one according to which forms metaphysically determine the minimal and the maximal quantity of matter which they can inform.

The second important step in Philoponus' discussion is its extension to the case of (inanimate) homogeneous substances (and especially to the component parts of animate beings):

> So then, just as for these things there needs to be some finite quantity as regards both largeness and smallness for the existence of the forms (εἰς τὸ ὑπάρξαι τὰ εἴδη), so

[435] PHILOPONUS, *On Aristotle* Physics *1.4-9*, OSBORNE (trans.), *op. cit.*, p. 41. For the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 97.9-10: "ὥσπερ οὖν ἐπὶ τὴν αὔξησιν ἀδύνατον ἐν παντὶ μεγέθει ὑπάρξαι τὰ εἴδη, οὕτω καὶ τὴν μείωσιν."

> evidently also for the uniform parts (τὰ ὁμοιομερῆ). For the uniform parts are forms as well. Hence evidently the form of flesh and the form of bone and the form of water could not occupy anything whatever, either as regards largeness […], or as regards smallness; rather there is always some size, such that the form of flesh could not occupy something smaller (οὗ ἐν τῷ ἐλάττονι οὐκ ἂν συσταίη τὸ εἶδος τῆς σαρκός). Hence there is a certain atomic (ἄτομος)[436] and minimal (ἐλαχίστη) flesh. And the same for every uniform part[437].

If any further confirmation were needed, it is clear from the way in which the argument is formulated that the case of (animate) heterogeneous and (inanimate) homogeneous entities is put by Philoponus on the same level. In both of them, the impossibility of the substantial form to persist in a quantity of matter inferior to its *minimum naturale* is an impossibility related to the metaphysical characterisation of forms. There is no logical or ontological priority of the case of (animate) heterogeneous entities (especially human beings) over that of (inanimate) homogeneous entities such as their homogeneous components.

Philoponus' discussion in his commentary on *Physics* I.4 is then complemented by the consideration of a wide range of objections to the axiom he has established. Unfortunately, it is not possible to consider all of them in detail here. Nevertheless, one of them cannot be overlooked, since it relates more directly to the discussion of the notion of (potential) infinite divisibility of magnitudes in the Aristotelian tradition which has been at the centre of the previous chapter. It is the passage, already quoted and discussed in the previous chapter, in which Philoponus develops his distinction between the issue of the (potential) infinite divisibility of matter considered as extended magnitude and the case of form. For expediency, I quote the passage again here:

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[436] It is easy to see how the reference to an "atomic" (ἄτομος), and not just a "minimal" (ἐλαχίστη), flesh represents an evolution of Themistius' conception of the "micro-units" of flesh (cf. *supra*). Nevertheless, the reference to atoms, already seen in the previous chapter in the context of both Philoponus' and Simplicius' discussion of the continuity of magnitudes and their (potential) infinite divisibility, should not be overestimated, and, in this case, it should not be taken as being more than a synonymous of a *minimum* of a given hylomorphic compound.

[437] PHILOPONUS, *On Aristotle* Physics *1.4-9*, OSBORNE (trans.), *op. cit.*, p. 41. For the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 97.15-19; 21-23: "ὥσπερ οὖν ἐπὶ τούτων ὡρισμένου τινὸς ποσοῦ χρεία ἐπὶ τε μέγεθος καὶ σμικρότητα εἰς τὸ ὑπάρξαι τὰ εἴδη, οὕτω δηλονότι καὶ ἐπὶ τῶν ὁμοιομερῶν· εἴδη γάρ τινα καὶ τὰ ὁμοιομερῆ. ὥστε δηλονότι καὶ τὸ τῆς σαρκός εἶδος καὶ τὸ τοῦ ὀστοῦ καὶ τὸ τοῦ ὕδατος οὔτε κατὰ μέγεθος ἐν τῷ τυχόντι συσταίη ἂν […], οὔτε κατὰ σμικρότητα· ἀλλ᾽ἔστι τι πάντως μέγεθος, οὗ ἐν τῷ ἐλάττονι οὐκ ἂν συσταίη τὸ εἶδος τῆς σαρκός. ἔστιν ἄρα τις ἄτομος καὶ ἐλαχίστη σάρξ. ὁμοίως καὶ ἐπὶ παντὸς ὁμοιομεροῦς."

> In response to these points, the mathematically trained raise a difficulty for us. If it is granted, say they, that the given straight line is divided in two[438], since every magnitude is divisible *ad infinitum*, evidently we might also divide the flesh, which you say is minimal, into two. Well then, are the divided bits flesh or not[439]?

This objection already shows the way in which medieval commentators will frame the problem of *minima naturalia*: on one side, matter, being an extended magnitude, is (potentially) infinitely divisible, on the other side, form is not. Therefore, what happens when one divides a material substance below its *minimum naturale*?

> In response to these points we say that it is possible to take flesh either as a form or as a magnitude. As a magnitude, flesh is divisible *ad infinitum* (so that it is not possible to get a minimal magnitude) whereas as a form it is no longer possible to divide it *ad infinitum*, but it will invariably stop at some minimal flesh; if we divide this, immediately we destroy the form of flesh simultaneously with the division. […] so also I say that even if you were to divide the minimal flesh, you would immediately destroy the form with the cut; for the minimal flesh (ἡ ἐλαχίστη σάρξ) is uncuttable (ἄτομος), and the pieces cut off are magnitudes but not flesh. Even if you put the pieces of the human being together a thousand times, you still would not make a human being, because it requires not just assembling the parts, but also the presiding nature (ἡ ἐπιστατούση φύσις) that imposes the forms. The same is true, I claim, for the uniform parts, that even if you put together the pieces of cut flesh a thousand times, you still will not make flesh, without the nature being indwelling (ἡ φύσις μὴ ἐνυπαρκούση). […] But the minimal flesh is also uniform (ὁμοιομερὴς), but in a quantity that preserves the entirety. For then it also preserves the form of flesh (τὸ τῆς σαρκός εἶδος σῴζει). Then indeed the parts taken potentially (δυνάμει) are flesh, since the whole is too, but once divided, they are no longer <flesh>[440].

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[438] This is not the appropriate place to investigate what could be the possible source (if there is any) of Philoponus' objection, and especially of the example of the straight line divided in two parts. However, one intriguing possibility is that, just like Themistius, also Philoponus is looking to the passage of *De sensu* 6 concerned with *minima sensibilia* and he is applying it to the case of *Physics* I.4. Indeed, at *De sensu* 6, 446a5-6 Aristotle notes, as already remarked, that "[…] the foot-length too exists potentially in the two-foot length, but actually only when it has been separated from the whole" (the passage will be quoted in its full form in the next chapter). This example, that of a mesure of length (which can be visualized as a straight line) divisible in two parts, seems to be quite close to Philoponus' formulation. Of course, the evidence is scant, and certainly less compelling than in the case of the millet-seed in Themistius. However, given the conceptual contiguity of the two passages, the hypothesis cannot be definitively rejected.

[439] PHILOPONUS, *On Aristotle* Physics *1.4-9*, OSBORNE (trans.), *op. cit.*, p. 42. For the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 98.13-16: "Πρὸς ταῦτα ἀποροῦσιν ἡμῖν οἱ ἀπὸ τῶν μαθημάτων. εἰ δέδοται, φασί, τὴν δοθεῖσαν εὐθεῖαν δίχα διελεῖν, ἐπειδὴ πᾶν μέγεθος ἐπ᾽ἄπειρον ἐστι διαιρετόν, δηλονότι καὶ ἥν φατε ἐλαχίστην σάρκα διέλοιμεν ἂν δίχα. τὰ οὖν διαιρεθέντα πότερον σαρκία ἐστὶν ἢ οὔ;"

[440] PHILOPONUS, *On Aristotle* Physics *1.4-9*, OSBORNE (trans.), *op. cit.*, pp. 42-43. For the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 98.21-26; 98.31-99.3; 99.7-9: "πρὸς ταῦτά φαμεν ὅτι τὴν σάρκα ἔστι λαβεῖν καὶ ὡς εἶδός τι [ἔστι] καὶ ὡς μέγεθος· ὡς μὲν οὖν μέγεθος οὖσα ἡ σὰρξ ἐπ᾽ἄπειρόν ἐστι διαιρετή (διὸ οὐδὲ ἔστι λαβεῖν ἐλάχιστον μέγεθος), ὡς μέντοι εἶδός τι οὖσαν οὐκέτι δυνατὸν ἐπ᾽ἄπειρον διελεῖν, ἀλλὰ πάντως καταλήξει εἴς τινα ἐλαχίστην σάρκα, ἣν ἐὰν διέλωμεν, εὐθὺς ἅμα τῇ διαιρέσει τὸ τῆς σαρκὸς ἐφθείραμεν εἶδος. […] οὕτω λέγω καὶ ἐὰν τὴν ἐλαχίστην σάρκα διέλῃς, εὐθὺς τῇ τομῇ ἔφθειρας τὸ εἶδος· ἄτομος γὰρ ἡ ἐλαχίστη σάρξ, καὶ τὰ τμηθέντα μόρια μεγέθη μέν εἰσι σάρκες δὲ οὔ. καὶ ὥσπερ τοῦ ἀνθρώπου κἂν μυριάκις συνθῇς τὰ μόρια, οὐκέτι ποιεῖς ἄνθρωπον, διότι οὐ μόνης τῆς συνθέσεως δεῖ τῶν μερῶν, ἀλλὰ καὶ τῆς ἐπιστατούσης

Philoponus' reply to the aforementioned objection consists in establishing a clear dichotomy between magnitude on one side and flesh (as an eponymous material substance) on the other[441]. Whereas magnitude is (potentially) infinitely divisible, regarding material substances as hylomorphic compounds there must be an inferior limit below which the substantial form of the material substance concerned cannot persist. This dichotomy (although not necessarily accompanied by the idea that forms metaphysically determine the minimal and the maximal quantity of matter which they can inform), as the rest of the chapter will show, had an immense echo on the Medieval Latin discussion of *minima naturalia*, through the formulation that Averroes provided of it.

Moreover, in this passage Philoponus also distinguishes his position from that of the atomists: indeed, it is not possible to form a material substance by simply putting together parts smaller than its *minimum naturale*, because such parts have lost their substantial form. Only a new process of generation could achieve such a result. Nevertheless, parts of a substance smaller than the *minimum naturale* have an autonomous ontological consistency (otherwise the *minimum naturale* of each material substance would become virtually equivalent to its atoms): Philoponus notes, in this respect, that "[…] even if the parts of the minimal flesh (τῆς ἐλακίστης σαρκός), are not themselves flesh, nevertheless they are entities; for they are magnitudes (μεγέθη) and bodies (σώματα)"[442].

φύσεως καὶ ἐπιτιθείσης τὰ εἴδη, οὕτω λέγω καὶ ἐπὶ τῶν ὁμοιομερῶν ὅτι κἂν μυριάκις συνθῇς τὰ μόρια τῆς τμηθείσης σαρκός, οὐκέτι ποιήσεις σάρκα τῆς φύσεως μὴ ἐνυπαρχούσης. […] ὁμοιομερὴς δὲ καὶ ἡ ἐλαχίστη σὰρξ, ἀλλ᾽ἐν ὅσῳ σῴζει τὴν ὀλότητα· τότε γὰρ καὶ τὸ τῆς σαρκός εἶδος σῴζει. Τότε οὖν τὰ δυνάμει λαμβανόμενα μέρη σάρκες, ἐπειδὴ καὶ τὸ ὅλον, ἐπὰν δὲ διαιρεθῇ οὐκέτι."

[441] The dichotomy, although clearer and more explicit, is clearly reminiscent of Themistius' opposition between body and flesh (again, as an eponymous material substance) discussed above. This is a point usually overlooked in modern analyses. It might be the case that, instead of a direct influence of Themistius on Philoponus, both are here relying on Alexander's discussion. However, whereas the idea of minimal parts in material substances seems to have been already present in Alexander (according to Simplicius' testimony in SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*, ed. DIELS, 170.9), it is unclear whether he also distinguished between body/magnitude on one side and material substances as endowed with a substantial form on the other.

[442] PHILOPONUS, *On Aristotle* Physics *1.4-9*, OSBORNE (trans.), *op. cit.*, p. 43. For the Greek text see PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 99.24-25: "[…] εἰ γὰρ καὶ μὴ σάρκες εἰσὶ τὰ μόρια τῆς ἐλακίστης σαρκός, ἀλλ᾽οὖν ὄντα ἐστί· μεγέθη γὰρ εἰσι καὶ σώματα."

2.3.3. Simplicius

The last extant Late Ancient commentary on the *Physics* is that by Simplicius. In his analysis of *Physics* I.4, Simplicius restates Aristotle's main arguments for the existence of *minima naturalia* (and he also sometimes reports his predecessors' additional arguments, such as those by Themistius[443]). Nevertheless, Simplicius' commentary on *Physics* I.4 is especially important for the present thesis because it provides additional support and confirmation to the idea that, in the intellectual world of Aristotelian commentators of the 6th century AD, Aristotle was thought to have developed a coherent and complete theory of *minima naturalia*, fully formulated (or formulable at least) in hylomorphic terms.

Indeed, in commenting on the second argument presented by Aristotle against Anaxagoras (*Physics* I.4, 187b13-21), the one based on the limits to the size of animate beings, Simplicius notes that:

> And if anyone says that every magnitude (μέγεθος) is divisible to infinity, and that it is therefore possible to have something smaller than whatever you take, let him know that the homoiomeries (ὁμοιομέρειαι)[444] [and *a fortiori* the animate beings they are components of] are not simply magnitudes, but magnitudes of certain kinds, flesh, bone, lead, gold etc., which cannot be divided to infinity while preserving

[443] For what concerns Themistius, cf. especially SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*, ed. DIELS, 167.25-168.2. The argument, as noted above, has been also reported by Philoponus (cf. PHILOPONUS, *Ioannis Philoponi in Aristotelis Physicorum libros tres priores commentaria*, ed. VITELLI, 102.24-104.7).

[444] In his analysis of this passage, H. KUBBINGA, *Le concept d'ἐλάχιστον chez Aristote et ses principaux commentateurs grecs*, in J.M.M.H. THIJSSEN, H.A.G. BRAAKHUIS (eds.), *The Commentary Tradition on Aristotle's* De generatione et corruptione. *Ancient, Medieval and Early Modern (Studia Artistarum 7)*, Turnhout, Brepols, 1999, pp. 47-67, p. 54, thinks that the use of the term by Simplicius implies that he considers homogeneous material substances as aggregates of homeomerous parts, taken as particles in the modern sense. Now, although the hypothesis is certainly fascinating, there is insufficient evidence for it in the passage concerned. Indeed, Simplicius is clear in stating that he is using the term in order to discuss Anaxagoras' views, and in order to demonstrate that, contrary to what Anaxagoras thinks, the only kind of parts (of "homoiomeries") into which a material substance can be actually divided are parts composed of both matter and form. Cf. SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*, ed. DIELS, 167.9-12, just before the passage quoted in the text (translation taken from SIMPLICIUS, *On Aristotle* Physics *1.3-4*, HUBY, TAYLOR (trans.), *op. cit.*, p. 74): "It is from homoiomeries of that kind [with upper and lower limits as to magnitude] that animals are composed, according to Anaxagoras, and divided into them; on his view there is nothing further than them. So they too have definite limits on their size; within those limits a thing remains in its proper form" ("ἐκ τῶν τοιούτων δὲ ὁμοιομερῶν σύγκειται τὰ ζῷα καὶ εἰς ταῦτα διαιρεῖται κατὰ Ἀναξαγόραν. οὐδὲν γὰρ τούτων ἀνωτέρω κατ᾽αὐτόν. ὥρισται ἄρα καὶ τούτων τὸ μέγεθος, μέχρι που προελθὸν ἐν τῷ οἰκείῳ εἴδει μενεῖ"). Moreover, cf. also (just after the passage quoted in the text) SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*, ed. DIELS, 167.17-18 (translation taken from SIMPLICIUS, *On Aristotle* Physics *1.3-4*, HUBY, TAYLOR (trans.), *op. cit.*, p. 75): "Those [the homoiomeries with upper and lower limits of size] are the principles which Anaxagoras posited, and they are not divisible" ("τοιαύτας δὲ ὑπετίθετο τὰς ἀρχὰς Ἀναξαγόρας καὶ οὐδὲ διαιρετὰς ταύτας").

> (φυλάττειν)[445] their form. As magnitudes, they too can be divided to infinity, but as flesh and bone they cannot[446].

As it is clear from the passage, Simplicius, as Philoponus, identifies a dichotomy between 'magnitudes' (μεγέθη, which, as stated in *Physics* VI, are potentially divisible to infinity) and forms, which, in order to persist in a given material substance, need a certain quantity of matter, their *minimum naturale*. The passage, thus, is a useful complement to the late ancient theory of *minima naturalia*, and it is in full agreement with Philoponus' presentation of it. Ironically, then, it seems that the two fierce adversaries were, for once, on the same side of the interpretation of Aristotle's text. This conclusion must nevertheless be tempered by noting that, whereas Philoponus asserts with great force and conviction his theory of *minima naturalia*, Simplicius seems to be somewhat more reticent, as if, although he subscribed to it as the correct interpretation of Aristotle's arguments, he would have preferred not to have to rely extensively onto it. This is confirmed by the following passage, which is concerned with the commentary on Aristotle's third argument against Anaxagoras (*Physics* I.4, 187b22-34, considering, as Simplicius does, 187b35-188a2 a separate argument):

> But it may be possible to establish the present argument even without the previously demonstrated conclusion [i.e., that there are *minima naturalia* in homogeneous material substances such as flesh], if Aristotle is now perhaps agreeing in a way to their [i.e., by Anaxagoras and his supporters] positing what he there [in the previous argument] showed to be impossible, that there can be a magnitude of any size you like (ὀπηλικονοῦν μέγεθος), when he says 'even if what is extracted is always smaller, all the same it will not exceed a certain magnitude in smallness' [*Physics* I.4, 187b29-30]. And, as I think, Aristotle is not showing without qualification that the extraction comes to an end, but that both from its coming to an end and from its not coming to an end there follows an absurd consequence for those who say that everything is in everything and that everything is extracted from everything, and who maintain that 'comes to be' says the same thing[447].

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[445] It is noteworthy that Simplicius uses the exact same verb introduced by Themistius to express the same concept (cf. *supra* and THEMISTIUS, *Themistii in Aristotelis Physica paraphrasis*, ed. SCHENKL, 15.32).

[446] SIMPLICIUS, *On Aristotle* Physics *1.3-4*, HUBY, TAYLOR (trans.), *op. cit.*, pp. 74-75. For the Greek text see SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*, ed. DIELS, 167.12-17: "εἰ δὲ λέγοι τις ὅτι πᾶν μέγεθος ἐπ᾽ἄπειρον ἐστι διαιρετὸν καὶ διὰ τοῦτο παντὸς τοῦ λαμβανομένου ἐστιν ἔλαττον, ἴστω ὅτι αἱ ὁμοιομέρειαι οὐχ εἰσὶν ἁπλῶς μεγέθη, ἀλλ᾽ἤδη τοιάδε μεγέθη, σάρξ καὶ ὀστοῦν καὶ μόλυβδος καὶ χρυσὸς καὶ τὰ τοιαῦτα, ἅπερ οὐχ οἷόν τέ ἐστιν ἐπ᾽ἄπειρον διαιρούμενα φυλάττειν τὸ εἶδος. ὡς μὲν γὰρ μεγέθη, ἐπ᾽ἄπειρον διαιρεῖται καὶ ταῦτα· ὡς δὲ σὰρξ καὶ ὀστοῦν, οὐκέτι."

[447] SIMPLICIUS, *On Aristotle* Physics *1.3-4*, HUBY, TAYLOR (trans.), *op. cit.*, p. 77. For the Greek text see SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*, ed. DIELS, 169.25-170.2: "Μήποτε δὲ δυνατὸν ἀποδειξαι καὶ χωρὶς τοῦ προαποδεδειγμένου συμπεράσματος τὸ νῦν ἐπιχείρημα, ἴσως τοῦ Ἀριστοτέλους, ὅπερ ἐκεῖ ἀπέδειξε τὸ ἀδύνατον ὀπηλικονοῦν εἶναι μέγεθος, νῦν συνχωροῦντός πως αὐτοῖς ὑποτίθεσθαι, ἐν οἷς φησιν, εἰ καὶ ἀεὶ ἐλάττων ἔσται ἡ ἐκκρινομένη, ἀλλ᾽ὅμως οὐχ ὑπερβαλεῖ μέγεθος τι τῇ σμικρότητι. καὶ οὐχ ὅτι ἐπιλείπει ἡ ἔκκρισις ἁπλῶς δείκνυσι νῦν ὁ

Now, there is little doubt that the interpretation of *Physics* I.4, 187b29-30 as allowing that there are no *minima naturalia* is ill-founded. To see this, it suffices to consider that the sentence occurs within the third argument against Anaxagoras (*Physics* I.4, 187b22-34), between the second argument against Anaxagoras, which had already argued in favour of the limits to the division of bodies (*Physics* I.4, 187b13-21) and the "additional proof" (the "corollary" to the third argument) that takes the existence of limits to the division of bodies for granted[448] (*Physics* I.4, 187b35-188a2). It is hard to imagine, then, that Simplicius' intention in this passage was to provide a correct interpretation of Aristotle's statement. Much more likely, Simplicius used the Aristotelian *dictum* as a pretext to express some caution as to the need of a full-fledged theory of *minima naturalia*. Such caution, therefore, can be taken as evidence that the theory of *minima naturalia* produced in Late Antiquity is to some extent an idiosyncratic result of Philoponus' creativity, rather than a shared achievement among commentators, although its existence and main characteristics were recognized both by Philoponus and Simplicius[449] and, probably, by the other 6th-century commentators on the *Physics*.

What influence such theory had on Medieval Islamic and Latin commentators will become clear in the rest of the chapter.

2.4. Medieval Positions on *Minima naturalia*: A Typology

Before starting to provide a reconstruction of the Medieval debate on *minima naturalia* in commentaries on *Physics* I.4, with a special focus on Medieval Latin commentaries, it might be useful to present a typology of the main positions at stake, so as to allow the reader to have an overview of what will be discussed in the chapter and

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Ἀριστοτέλης, ὡς οἶμαι, ἀλλ᾽ ὅτι καὶ τῷ ἐπιλείπειν καὶ τῷ μὴ ἐπιλείπειν ἅπλον τι ἀκολουθεῖ τοῖς πᾶν ἐν παντὶ λέγουσι καὶ πᾶν ἐκ παντὸς ἐκκρίνεσθαι, ταὐτὸν δὲ εἰπεῖν γίνεσθαι ἀξιοῦσι."

[448] Strictly speaking, as seen above, only the second argument against Anaxagoras (*Physics* I.4, 187b13-21) is an argument for the existence of limits to the division of bodies. The third argument (*Physics* I.4, 187b22-34), although less explicitly, also takes the existence of *minima naturalia* for granted.

[449] Indeed, after the passage just quoted, Simplicius reaffirms the existence of *minima naturalia* and their hylomorphic nature repeatedly, especially while commenting on *Physics* I.4, 187b35-188a2 (cf. SIMPLICIUS, *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*, ed. DIELS, 171.12-27).

also to be able to readily position each doctrine that will be presented within a larger theoretical framework[450].

In crude summary, it is certainly possible to say that the most fundamental distinction that emergers by looking at Medieval Latin doctrines of *minima naturalia* is that between "extrinsic" and "intrinsic" doctrines of *minima naturalia*.

By "intrinsic" doctrines of *minima naturalia* I refer to all the doctrines that take the existence of *minima naturalia* in material substances (I will focus almost exclusively on the problematic case of homogeneous material substances, as said) to depend on factors internal to the substance itself. That is to say, according to these doctrines even by considering a (homogeneous) material substance "in isolation" from its environment, and from any relation with other material substances, it is possible to identify a meaningful notion of *minima naturalia*. Of course, there are various kinds of "intrinsic" doctrines of *minima naturalia* that were advocated by Medieval Latin commentators.

The metaphysically most “radical” one is certainly the idea according to which the substantial form of every (homogeneous) material substance determines the maximal and minimal quantity of matter which it can inform. In this sense, below such a minimal quantity of matter the substantial form of the material substance concerned is immediately corrupted. I will refer to this doctrine, as already mentioned, as that of *minima secundum formam*.

Another, less metaphysically “radical” "intrinsic" doctrine of *minima naturalia* tended, instead, to focus on the idea that, although there is no fixed minimal quantity below which the substantial form of a given (homogeneous) material substance considered "in isolation" is immediately corrupted, there is a fixed minimal quantity below which the substantial form of the substance concerned loses the power to perform its proper operation. I will refer to this doctrine as that of *minima secundum operationem*.

An "intrinsic" doctrine of *minima naturalia* that appears to be extremely similar to that of *minima secundum operationem*, yet that is fundamentally different in at least one respect, is the doctrine of *minima secundum actionem*. According to such doctrine,

[450] Note that almost all the names of the doctrines of *minima naturalia* distinguished in the thesis are used in agreement with MURDOCH, *The Medieval and Renaissance Tradition of* Minima naturalia, *op. cit.* The only exceptions are the name of *minima secundum formam* and of *minima secundum actionem*, which are my own (although the latter one is based on an expression used by commentators adopting the respective doctrine).

below a certain threshold of smallness of the matter that it informs, the substantial form of a (homogeneous) material substance, while still able to start performing its proper operation, is not strong enough to achieve its intended effect.

A position, finally, which constitutes a "limit case" of "intrinsic" *minima naturalia* is the doctrine according to which, below a certain threshold of smallness, we cannot cognise the substantial form of a (homogeneous) material substance insofar as we are not able to perceive the portion of matter that it informs. This doctrine, to which I refer as that of *minima secundum sensum*, is, of course, more a doctrine of *minima sensibilia* than of *minima naturalia*, insofar as it concerns the action of sensible qualities of extremely small portions of homogeneous material substances on the external senses so as to engender a sensation. More than that, it is also a rather bold doctrine of *minima sensibilia*, insofar as it presupposes the existence in the actual world (or at least as a conceptual possibility) of sensible qualities that are not perceptible in act. What is the ontological and epistemological understanding of sensible qualities underlying such a doctrine, however, will become clear in the next chapters, what matters underlining here is that all the commentators adopting the view of *minima secundum sensum* as applying to substantial, and not merely accidental, forms take the doctrine of *minima secundum sensum* to represent a doctrine of *minima naturalia*, and not (merely) of *minima sensibilia*, insofar as the action of the accidental forms of sensible qualities is considered as the way in which the substantial form itself of homogeneous material substances is able to act on the external senses, albeit indirectly. Remarkably, however, commentators adopting this view claim that the fact that the sensible qualities of extremely small portions of (homogeneous) material substances are not able to act on the external senses so as to engender a sensation is due to the limitations of the sensory powers of the external senses, not of sensible qualities themselves, which are always "active" towards the external senses. As a result, it might be objected that there is no reason to consider the doctrine of *minima secundum sensum* an "intrinsic" doctrine of *minima naturalia* in (homogeneous) material substances, insofar as it is based on an entirely "extrinsic" factor, namely, the limitations of the sensory powers of the external senses. Nevertheless, insofar as the intensity of the action of sensible qualities depends on the dimensions of the portion of a material substance in which they inhere, it seems at least fair to claim that the fact that the sensible qualities of extremely small portions of (homogeneous) material

substances are not able to act on the external senses with an intensity sufficient for them to engender a sensation, given the limitations of sensory powers, there is at least a sense in which *minima secundum sensum* are the result of an "intrinsic" factor, rather than merely an "extrinsic" one, and, what is more, such an "intrinsic" factor is fundamentally analogous to the ones underlying *minima secundum operationem* and *minima secundum actionem*.

With the doctrine of *minima secundum sensum*, all the fundamental Medieval Latin doctrines of "intrinsic" *minima naturalia* have been introduced. The other fundamental category of *minima naturalia* in the Medieval Latin debate is, as said, that of "extrinsic" *minima naturalia*. By "extrinsic" doctrines of *minima naturalia*, instead, I refer to doctrines that take the existence of *minima naturalia* in (homogeneous) material substances to depend on entirely "contingent" and external factors. More in particular, commentators embracing this doctrine believe that it is not possible to identify any meaningful notion of *minimum naturale* by considering a substance "in isolation", so to speak, whereas it is possible to do so only once the substance is considered as part of its environment, and therefore the corrupting action exercised on it by the containing medium (an aspect that, unsurprisingly, is not present in *Physics* I.4, but that features rather prominently in *De sensu* 6) is taken into account. It is exactly due to the corrupting action of the containing medium that extremely small portions of (homogeneous) material substances, below a certain threshold of smallness, once separated from the whole to which they belong are corrupted and lose their substantial form. The only *minimum naturale* that can be identified, according to this doctrine, is therefore the smallest portion of a homogeneous material substance that can resist, once separated from the whole to which it belongs, to the corrupting action of the containing medium. Throughout this and the next chapters I will refer to this doctrine as that of *minima secundum corruptionem*.

2.5. Avicenna's and Averroes' Doctrines of *Minima naturalia*

2.5.1. Avicenna: The First Medieval Doctrine of *Minima secundum corruptionem*

The topic of *minima naturalia* did not reach, as so many others, the Latin West without the mediation of the Islamic tradition. Indeed, among others, Averroes exerted a fundamental influence on the way in which Latin commentators, starting with the early

13th century, read the *Physics* and the *De generatione et corruptione*. Nevertheless, before turning to Averroes' doctrine, it is crucial to look at the interpretation of *minima naturalia* provided by Avicenna, which, although it did not directly reach the Latin Middle Ages[451], certainly exerted an important influence on Averroes' own doctrine and, what is more, it also helps situating the overall debate on *minima naturalia* in the Islamic tradition in the wider context of the polemic against *Kalām* atomism, an aspect to which I have briefly referred to in the previous chapter of this thesis.

Avicenna's theory of *minima naturalia* has recently been recognised and brought to light in a pioneering article by Jon McGinnis[452]. In the presentation of Avicenna's theory, I mostly rely on McGinnis' presentation, albeit suggesting a few supplementary considerations and connections, especially for what concerns the influence of *De sensu* 6 on Avicenna, that McGinnis mostly disregards.

The first aspect to bear in mind when considering Avicenna's theory of *minima naturalia* in the context of the present thesis is that such a theory is developed by Avicenna in *Physics* III.12, that is, the twelfth chapter of Book III of *al-Shifā*'s *Physics*, which is dedicated to a discussion of continuity and (potential) infinite divisibility[453]. Thus, rather than representing a mere commentary on Aristotle, Avicenna's theory is an original one (albeit one strongly indebted to Aristotle and, especially, to Philoponus), and, what is more, it is a theory that is inserted into a systematic and refined analysis of continuity.

Secondly, given that the Latin translation of Avicenna's *Physics* III stopped at chapter 10 (chapter 9 in the Latin translation), such a theory did not directly influence the Latin Middle Ages. Nevertheless, for its intrinsic importance, for the information it provides on the influence of Late Ancient theories of *minima naturalia* in the Islamic

[451] Indeed, Avicenna's doctrine of *minima naturalia* was contained in one of the chapters of the third tractate of the first book of *al-Shifā*'s *Physics* that was not included in the Medieval Latin translation of the tractate (cf. AVICENNA, *Avicenna Latinus: Liber Primus Naturalium, Tractatus tertius, De his quae habent naturalia ex hoc quod habent quantitatem*, ed. JANSSENS).

[452] MCGINNIS, "A Small Discovery: Avicenna's Theory of *Minima Naturalia*", *op. cit.* This aspect of Avicenna's natural philosophy does not receive any attention in A. LAMMER, *The Elements of Avicenna's Physics: Greek Sources and Arabic Innovations*, *op. cit.*, which only mentions the issue of *minima naturalia* in Avicenna, without dedicating any specific consideration to it, on p. 169, n. 198, in the context of a discussion of the notion of the form of corporeality in Avicenna.

[453] For an updated (and in-depth) introduction to Avicenna's positions on the continuity and infinite divisibility of material substances in Book III of *al-Shifā*'s *Physics*, in addition to the references quoted in the previous chapter, see LAMMER, *The Elements of Avicenna's Physic*, *op. cit.*, especially chapter 3 and § 6.3.

tradition and, finally, for its influence on Averroes' own theory, its discussion is crucial to the present chapter.

Avicenna's theory is based on a careful distinction between conceptual and physical divisibility, one aspect that, as seen in the previous chapter, continued to haunt discussions of continuity in the Aristotelian tradition up to the late Middle Ages. Avicenna is extremely clear in stating that he is not discussing the conceptual division of a material substance that is performed by the estimative faculty and in connection with which there are no *minima naturalia* whatsoever in material substances, but rather the far more complex issue of its "physical" division, in terms of an actual separation of (quantitative) part from part.

Avicenna's discussion of the case of the physical divisibility of material substances can be divided in two parts. In the first one (roughly corresponding to *Physics* III.12, 3-5) Avicenna provides a sort of commentary of Aristotle's arguments against Anaxagoras in *Physics* I.4, more precisely of the second one, which, as explained above, is the one which introduces the issue of the limits to divisibility of 'bodies'. Avicenna's first interpretation is convoluted and based on a series of considerations depending on the nature of mixtures (Avicenna, indeed, takes the issue of mixture to be directly dependent upon, and closely connected to, that of *minima naturalia*), and I disregard it here, since it does not add anything of value to the discussion of *minima naturalia*[454]. On the contrary, the second interpretation that Avicenna provides anticipates important elements which will characterise the Medieval Latin debate on the issue of *minima naturalia* in the first reception of Aristotle's *libri naturales* in the Latin West around the half of the 13th century. Avicenna considers the fact that the performance of the operations proper to each species (the discussion focuses on humans, and more generally living beings, but it also concerns inanimate homogeneous substances) requires a certain minimal size. As such, it must be quoted in full:

> An example, then, is the fact that a human will be incapable of doing those things characteristic of a human unless his body is such as to perform human activities adequately. Not the least of [these activities] are that he have a power [that is, the form of human] and a tool [that is, a body] by means of which he can seek out and make a home (assuming there is no impediment), and by which he can fashion clothes, and [do] everything else a human must do to exist, as well as not being such

[454] Cf. AVICENNA, *al-Shifā*'s *Physics* III.12, 3 and MCGINNIS, "A Small Discovery: Avicenna's Theory of *Minima Naturalia*", *op. cit.*, pp. 16-17.

> that strong winds blow him about as so much dust and that the predominating lower qualities in him [i.e. hot, cold, wet and dry] do not change him[455].

The crucial point of the argument, as noted by McGinnis, is the fact that Avicenna identifies the substantial form of a material substance (in the example a human being) with the power (*qūwa*) to produce its essential operations. This line of thought will find an important posterity in the 13th-century Latin world, as I will show in this chapter and also in Chapter 4 (in connection with the issue of the essential operation of the accidental forms of sensible qualities), thanks, however, not to Avicenna's argument but rather to a similar one to be found in Averroes' *Long Commentary* on *Metaphysics* Θ. More than that, an important view on *minima naturalia* developed around the middle of the 13th century in the Latin world, as it will be shown below, would be based on the idea that, although there are no *minima naturalia* strictly speaking in material substances, still the performance of certain operations (such as that of acting on the external senses) requires a certain minimal size in order to be performed by a material substance (therefore giving rise to what I call *minima secundum operationem, minima secundum actionem* or merely *minima secundum sensum*, depending on how the impossibility to perform the operation is conceived, and on whether perception is or not the only operation considered).

After this first part of the chapter, and after having considered and rebuked once again the existence of limits to the conceptual divisibility of material substances, with an additional argument (in my view strongly reminiscent of Aristotle's dilemma *in De generatione et corruptione* I.2 discussed in the previous chapter, although McGinnis does not mention any connection[456]), Avicenna provides his full and considered theory of *minima naturalia* in material substances in the case of a physical process of division. It is not easy to see how this conception of *minima naturalia* is to be reconciled with the one presented above, unless one takes this second argument to be the one Avicenna would use in case one did not accept the one provided before, or, more likely, in case one were to say that the argument presented above simply applies to the case of living beings. Avicenna's argument goes as follows:

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[455] AVICENNA, *al-Shifā*'s *Physics* III.12, 5. The passage is quoted in McGinnis' translation (cf. MCGINNIS, "A Small Discovery: Avicenna's Theory of *Minima Naturalia*", *op. cit.*, p. 17).
[456] Cf. MCGINNIS, "A Small Discovery: Avicenna's Theory of *Minima Naturalia*", *op. cit.*, pp. 18-20.

> Whenever bodies become smaller, they are increasingly disposed to being more quickly acted upon by other [bodies] […]. So, apparently, when the body exceeds its degree of smallness and separates off from its collective kind, it would be impossible for it to retain its form at that time; but, rather, as a result of the bodies surrounding it, it will undergo alteration [but here Avicenna is clearly referring to substantial change, not alteration in the Aristotelian sense] into them and become continuous with them. As such, it will not maintain its form until mixed[457].

Now, Avicenna's position is clear enough: what happens to the substantial forms of material substances upon division is that, by being associated with smaller and smaller portions of matter, they become progressively incapable to resist to the corrupting action of the containing medium, until they are transformed into it by a process of substantial change. This is one of the first mature presentations of the position which, as said, I will call that of *minima secundum corruptionem*, one which, although independently from Avicenna (but likely due to the same Aristotelian sources which also influenced Avicenna in his formulation), was to have a great posterity in the Latin Middle Ages. McGinnis seems to be convinced that this argument is strongly influenced by Aristotle's *De generatione* I.10, 328a18-35 and, to a much more limited extent, by comments made by Philoponus upon this passage. Still, even the cursory presentation of Aristotle's solution to the problem of *minima sensibilia* in *De sensu* 6 presented above makes it hard to deny that Avicenna could be here relying (directly or indirectly) on the text of *De sensu* 6 in order to develop his considered conception of *minima naturalia*. Indeed, while the mere idea of a substantial form which is in such a small quantity so as to be corrupted by the containing medium could be found also in *De generatione* I.10, the reference to a body which is separated from its "collective kind" (considering *kullīya*, in this context, as possibly referring to the whole to which the body belongs, that is, to the material substance as such) seems to constitute a rather direct reference to the distinction between the parts in the whole and the parts separated from the whole that Aristotle develops in *De sensu* 6, and which has no direct equivalent in *De generatione* I.10. More than that, it is interesting to suppose, in this respect, that Avicenna might also have been referring to Alexander of Aphrodisias' commentary on *De sensu* 6. Indeed, the idea that parts of a body separated from it in such an extremely small quantity so as not to be able to retain the substantial form of the whole to which they belong could regain it once mixed

[457] AVICENNA, *al-Shifā*'s *Physics* III.12, 8. The text is quoted in McGinnis' translation (cf. MCGINNIS, "A Small Discovery: Avicenna's Theory of *Minima Naturalia*", *op. cit.*, p. 20).

(supposedly, with a sufficient amount of matter endowed with the same substantial form) is strongly reminiscent of a passage in Alexander's commentary, one which will be analysed in the next chapter. Be that as it may for what concerns Alexander, the influence of *De sensu* 6 on Avicenna's doctrine of *minima naturalia* seems hard to deny. McGinnis, at the beginning of his article[458], takes into account the possibility that *De sensu* 6 might have influenced Avicenna's doctrine of *minima naturalia*, but he remains agnostic about it. I think, nevertheless, that a close reading of the argument mentioned above makes it rather likely to identify a direct influence of the text of *De sensu* 6 on Avicenna's doctrine of *minima naturalia*[459].

2.5.2. Averroes: Introducing *Minima secundum formam* into the Middle Ages

It is now time to turn to Averroes' discussion of *minima naturalia*. As mentioned in the previous chapter, such discussion has a strong debt towards Ruth Glasner's pioneering analyses of the Latin, Islamic and Hebrew tradition of the text of Averroes' three commentaries on the *Physics*[460]. Although my presentation of Averroes' doctrine of *minima naturalia* is strongly dependent on Glasner's one, my discussion will be based almost exclusively on the *Long Commentary* on the *Physics*. This is due to two reasons: first of all, the other commentaries do not add any substantial element to the doctrine as presented in the *Long Commentary*. Secondly, and equally importantly, this was the only one of Averroes' commentaries on the *Physics* to reach the Latin Middle Ages, so that

[458] Cf. MCGINNIS, "A Small Discovery: Avicenna's Theory of *Minima Naturalia*", *op. cit.*, p. 5.

[459] Probably it will be possible to formulate firmer conclusions only with the critical edition of the Arabic translation of the first six treatises of the *Parva naturalia*, the *Kitāb al-Ḥiss wa-l-maḥsūs*, dating back to the time of al-Kīndī, which is in preparation by Rotraud Hansberger, especially given that this work is likely closer to a paraphrase than to a translation of the corresponding Aristotelian texts, where also Neoplatonic and Galenic elements play an important role (cf., for a presentation of these issues, R. HANSBERGER, Kitāb al-Ḥiss wa-l-maḥsūs. *Aristotle's* Parva naturalia *in Arabic Guise*, in C. GRELLARD, P.-M- MOREL, *Les* Parva naturalia *d'Aristote, Fortune antique et médiévale (Philosophie 28)*, Paris, Éditions de la Sorbonne, 2010, pp. 143-162).

[460] Cf. GLASNER, *Averroes' Physics. A Turning Point in Medieval Natural Philosophy*, *op. cit.*; Glasner's reconstruction of Averroes' theory of *minima naturalia* hasd also been previously presented, in a preliminary form, in R. GLASNER, "Ibn Rushd's Theory of *Minima Naturalia*", *Arabic Sciences and Philosophy* 11 (1), 2001, pp. 9-26. For some more considerations focusing instead on the remarks relevant to Averroes' theory of *minima naturalia* to be found in his *Middle Commentary* on the *De generatione* (an aspect on which it is unfortunately impossible to focus here) see C. CERAMI, *Mélange,* minima naturalia *et croissance animale dans le* Commentaire moyen *d'Averroès au* De generatione et corruptione *I,5*, in J. BIARD, S. ROMMEVAUX (eds.), *La nature et le vide dans la physique mèdiévale. Études dédiées à Edward Grant*, Turnhout, Brepols, 2012, pp. 137-164.

Averroes' (decisive) influence on the Medieval Latin debate on *minima naturalia* passed exclusively through it.

The first important element to notice with regard to Averroes' discussion of *minima naturalia* in the *Long Commentary* on the *Physics* is that virtually no significant element of such discussion can be found in the commentary on *Physics* I.4, the *locus classicus* where, as seen above, Late Ancient commentators introduced their considerations on the topic (as Medieval Latin commentators will later do). Indeed, Averroes' commentary is constituted by a continuous exposition of the Aristotelian text and, as such, while commenting upon *Physics* I.4, Averroes did not feel the need to insert a discussion which would have led astray from the main issue of the chapter, which was Aristotle's critique of Anaxagoras' double tenets that everything is present in everything and that everything comes to be out of everything. Of course, there are some references in the commentary on *Physics* I.4 to the problem of the (potential) infinite divisibility of material substances, but this only in order to clarify the Aristotelian text. For instance, while explaining Aristotle's first argument concerning *minima naturalia*, Averroes notes that:

> […] Given that the whole in [living] compounds follows the part in [the fact] that they are finite, and [given that] the whole, which is an animal or a plant, is finite, it is necessary that its parts, i.e. flesh, bones, and fruits, are finite[461].

The passage restates, in a shorter and more formalised way, Aristotle's second argument against Anaxagoras.

Averroes, then, goes on to expound Aristotle's third argument against Anaxagoras:

> […] and it is also evident by itself, that the quantity of flesh is finite in magnitude and in smallness: [indeed,] it is evident that from the minimal flesh, i.e., that flesh of which none is smaller, it is impossible that a smaller body totally similar [to it] is extracted. Indeed, since the extraction proceeds without ending, also the reduction of the body from which the extraction happens [proceeds without ending]; and if it proceeds without ending, it is necessary that that body from which those bodies are extracted reaches a minimal quantity of that species of body, and then it will be impossible, that something is extracted from it, since it will become smaller than it

[461] AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentaris*, Venetiis 1562, f. 24rE: "[…] cum totum in compositis sequitur partes in hoc quod sunt terminatae, et totum, quod est animal aut planta, est terminatum, necesse est ut partes eius, i.<e.> caro, et os, et fructus, sint terminatae."

should be, which is against the supposition: therefore it is necessary that the extraction stops[462].

Here, although the exposition remains quite literal, it is nevertheless interesting to notice that Averroes translates Aristotle's argument as applying to the *minimum* of a given *species corporis*, i.e., of a given (hylomorphically understood) material substance.

Nevertheless, it is clear that these brief remarks do not amount to a proper discussion of *minima naturalia*, especially considering that the (potential) infinite divisibility of matter *qua* continuous magnitude (the major source of theoretical tension at the core of the debate on *minima naturalia*) is never even mentioned in the commentary on *Physics* I.4.

Apart from a passage in the commentary on *Physics* IV[463], and apart from a reference to the issue of the minimal quantity of matter required for the generation of a given material substance (a separate, albeit connected, issue than that of *minima naturalia*, and one which will be referred to, in the chapter, as that of *minima materia*[464]) in *Physics* VI[465], the first substantive discussion of *minima naturalia* in Averroes' *Long*

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[462] AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentaris*, Venetiis 1562, f. 25rF-vG: "[…] et etiam est manifestum per se quod quantitas carnis est terminata in magnitudine et parvitate; manifestum est quod ex minima carne, scilicet qua nulla caro est minor, impossibile est exire corpus consimile omnino. Nam, quoniam exitus procedit semper, et minoratio corporis, ex quo est exitus; et si procedit semper, necesse est ut illud corpus, a quo exeunt haec corpora, perveniat ad minimam quantitatem illius speciei corporis, et tunc erit impossibile, ut ex eo exeat aliquid, quoniam tunc fieret minus quam deberet esse, quod est contra positum; ergo necesse est ut cesset exitus."

[463] Cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentaris*, Venetiis 1562, f. 163vH: "[…] quoniam, quemadmodum linea, secundum quod est linea, potest dividi in infinitum, quod est impossibile, secundum quod est linea terrestris, aut ignea […]." For a commentary on this passage, also in connection with other important passages from the *Long* and *Middle Commentary* on the *Physics* and the *Middle Commentary* on the *De Caelo*, see GLASNER, *Averroes' Physics. A Turning Point in Medieval Natural Philosophy*, *op. cit.*, p. 153, n. 76. Note, however, that one of the other passages quoted in this context by Glasner (who takes the quotation from VAN MELSEN, *Van Atomos naar Atoom. De geschiedenis van het begrip Atoom*, *op. cit.*), namely the passage referred to as 'VI.32, Latin 267D', which in Van Melsen's translation, as quoted by Glasner, reads "'It is impossible for something to increase or decrease infinitely, because if the quantity determined by nature is passed, whether by increase or decrease, the being perishes'" (GLASNER, *Averroes' Physics*, *op. cit.*, p. 153, n. 76), is a mistranslation of the passage which I quote in n. 465 below. The mistake is all the more serious because Averroes' original passage does not refer to *minima naturalia*, as it would seem in van Melsen's translation, but rather to the separate, albeit connected, issue of the *minima materia* (see below the references in n. 464 and later in this chapter).

[464] This is an aspect that, as it will be shown below, Medieval Latin commentators will tend to discuss in connection with *minima naturalia*, starting at least with John Duns Scotus. For an introduction to the connection between the two issues, see especially H. LAGERLUND, *Averroes and the Development of a Late Medieval Mechanical Philosophy*, in A. BALA, P. DUARA (eds.), *The Bright Dark Ages. Comparative and Connective Perspectives (Knowledge Infrastructure and Knowledge Economy 5)*, Leiden, Brill, 2016, pp. 109-119, esp. section 2, pp. 114-118, but also LAGERLUND, *Material Substance*, *op. cit.*, p. 478.

[465] Cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentaris*, Venetiis 1562, f. 267rD: "Primum autem in generatione et corruptione est minima pars quae potest inveniri de generato. Minimum nam de omni generato est

Commentary occurs instead at the beginning of the commentary on *Physics* VII, especially on *Physics* VII.1, concerning the existence of a first moved part in motion:

> And it is necessary here that there is a first part in motion, *because natural bodies are not divided to infinity insofar as they are natural bodies*, for instance because the first moved part in fire is the minimal part which can be fire in act, and similarly the first movement of the natural heat of the animals is also the minimal part which can move that animal[466].

The passage is noteworthy because it introduces the distinctively "Philoponean" (and Late Ancient more generally) dichotomy between the division of a body *qua* continuous magnitude and its division *qua* material substance endowed with a substantial form. In this, Averroes' approach seems to stretch back to the Late Ancient commentary tradition in a way which is not fundamentally influenced by Avicenna's own reading. Still, this idea is easily dispelled if one looks at the last passage of the commentary explicitly affirming the existence of *minima naturalia* in natural susbtances, a passage which comes from the commentary on *Physics* VIII and which, again, starts from the case of motion:

> Then he [Aristotle] says "But if [motion] is divided, etc.", that is to say, it is impossible [that], as the moved [body] is infinitely divided in act, so in a similar way the moving [body], because then the division would come to this, that their nature would be corrupted, for instance that, if the first [body] moved by itself were this immense fire, from which we take away a part, and then another, and then another, we would reach such a quantity that, if it is divided, the fire will be corrupted, since the minimal quantity of fire is determined[467].

In this passage (once again) the theory of *minima naturalia* is discussed in the conjoined case of motion and of material substances, better, in the case of material substances insofar as they are taken to be the first moved entity. Still, in this passage Averroes states clearly that what happens in the case of material substances when their *minimum naturale*

terminatae quantitatis, verbi gratia quod minima pars ignis est terminata, scilicet minima pars quae potest esse ignis."

[466] AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentaris*, Venetiis 1562, f. 307vI: "Et necesse est hic esse prima mota, *quia corpora naturalia non dividuntur in infinitum in eo quod sunt corpora naturalia*, verbi gratia quoniam primum motum in igne est minima pars quae potest esse ignis in actu, et similiter primum motum caloris naturalis animalium est etiam minima pars quae potest movere illud animal" (my emphasis).

[467] AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentaris*, Venetiis 1562, f. 384vI-K: "Deinde dicit *Sed si dividatur*, etc., i.<e.>, et est impossibile, ut motum dividatur in actu in infinitum, et similiter motor, quoniam tunc divisio perveniet ad hoc, quod eorum natura corrumpetur, verbi gratia quod, si primum motum ex se fuerit ignis iste demisuratus, a quo auferemus partem, et postea aliam, et postea aliam, perveniemus ad talem quantitatem, quod si dividatur, corrumpetur ignis, cum minima quantitas ignis sit determinata."

is divided is that the substance loses its substantial form and, supposedly, acquires that of the containing medium. What is crucial to remark, however, is that Averroes, in this passage, does not explicitly mention the corrupting action of the medium. On the contrary, according to the passage the process of corruption seems rather to be caused by a fully intrinsic cause (a cause, therefore, that would be fully operative even in the absence of the corrupting action of the containing medium), namely, the metaphysical inability of the substantial form of the given material substance, in this case fire, to subsist within extremely small quantities of it. In this sense, Averroes, contrary to Avicenna, does not posit any notion of *minima secundum corruptionem*. Rather, the kind of *minima* Averroes seems to have in mind are *minima secundum formam*, a position which, in the Latin West, was to be defendend most prominently by Thomas Aquinas, but also by Peter of Auvergne, by Adam of Buckfield and by Thomas Wylton, among others, as I will show below.

Interestingly, therefore, when one looks at Averroes' overall conception of *minima naturalia* in the perspective of the (major) influence that it was to have on the Latin Middle Ages, what one remarks is that Averroes' influence waws twofold. On the one hand, his strong and clear-cut affirmation of the necessity to posit *minima naturalia* in material substances (and especially in inanimate homogeneous ones), best summarised in the form of the dichotomy between a body considered *qua* continuous magnitude and a body considered *qua* material substance, shaped the way in which all the Medieval Latin commentators framed the debate on *minima naturalia*. On the other hand, the specific reason he posited for the existence of *minima naturalia*, i.e., the doctrine of *minima secundum formam*, exerted a much deeper influence on the specific Medieval Latin commentators who adopted the same view.

2.6. The Medieval Latin Debate on *Minima naturalia*: Historiographical *Prolegomena*

Before starting to reconstruct the Medieval Latin debate on *minima naturalia* for the period ca. 1250-ca. 1350, a few historiographical remarks are in order. Indeed, during the last century, the debate on *minima naturalia* in the Latin West has received three very important syntheses in the secondary literature (barring a number of scientifically less

rigorous attempts[468]), i.e., those by Pierre Duhem[469], Anneliese Maier[470] and, more recently, John Murdoch[471]. Duhem's overall analysis is based on a fundamental distinction between a 'physical' and a 'metaphysical' distinction, one which is severely outdated[472]. As a result, and given that all his theoretical acquisitions have been integrated both in Maier's and in Murdoch's successive works, I disregard it in what follows. Instead, I follow quite closely both Maier and Murdoch's discussions of individual authors and general trends (so that presenting them here in detail would have been less useful, and more cumbersome, than discussing them alongside the various steps of my own reconstruction of the debate). This does not mean that I do not have major objections to both studies. The most important one, concerned specifically with Murdoch's analysis, is, as already said, the fact that Murdoch downplays the importance of *De sensu* 6 for Medieval Latin doctrines of *minima naturalia*, something which I take to be a serious historiographical mistake, as the rest of this chapter will show (Maier, on the other hand, simply does not consider the issue in a specific way). More than that, both Murdoch and Maier seem to consider the main difference of 14th-century theories of *minima naturalia*, when compared with 13th-century ones, to be the fact that *minima naturalia* are mainly discussed, in the 14th century, within the theoretical framework of so-called "limit-

[468] See, for instance (at least for their very limited adherence to the sources), VAN MELSEN, *Van Atomos naar Atoom. De geschiedenis van het begrip Atoom*, *op. cit.*, DIJKSTERHUIS, *De Mechanisering van het Wereldbeeld*, *op. cit.*, and PYLE, *Atomism and Its Critics: From Democritus to Newton*, *op. cit.* Other works, such as PABST, *Atomtheorien des lateinischen Mittelalters*, *op. cit.*, have the different problems of including sections on the Medieval Latin debate on *minima naturalia* that are so short so as to be unable to contribute significantly to our knowledge of the issue. For a comprehensive presentation of these and all the other main works in secondary literature discussing the Medieval Latin debate on *minima naturalia* which I have excluded from my overview, and for important criticisms of them, see MURDOCH, *The Medieval and Renaissance Tradition of* Minima naturalia, *op. cit.*, pp. 91-96.

[469] P. DUHEM, *Le système du monde, histoire des doctrines cosmologiques de Platon à Copernic, tome VII*, Paris, Hermann, 1956, pp. 3-157, which is the posthumuous and more refined version of what already discussed in ID., *Études sur Léonard de Vinci. Ce qu'il a lus et ceux qui l'ont lu. Seconde Série*, Paris, Hermann, 1909, pp. 3-53 and pp. 368-407.

[470] A. MAIER, *Die Vorläufer Galileis im 14. Jahrundert. Studien zur Naturphilosophie der Spätscholastik*, Roma, Edizioni di Storia e Letteratura, 1949, pp. 155-215 (now reprinted in EAD., *Ausgehendes Mittelalter. Gesammelte Aufsätze zur Geistesheschichte des 14. Jahrunderts (Bd. 1)*, Roma, Edizioni di Storia e Letteratura, 1964, pp. 41-85), which, for what concerns the section on *minima naturalia*, mostly presents the same text of the second part of a previous article (cf. EAD., "Das Problem des Kontinuums in der Philosophie des 13. und 14. Jahrunderts," *Antonianum* XX, 1945, pp. 331-68).

[471] MURDOCH, *The Medieval and Renaissance Tradition of* Minima Naturalia, *op. cit.*

[472] Although, as this thesis makes clear, the importance of ontological considerations to Medieval Latin theories of *minima naturalia* cannot be underestimated, so much so that the Medieval Latin understanding of *minima naturalia* is mostly concerned with the problem of the persistence of substantial forms through division.

decision" problems[473]. I think that, while of course this is the case, the fundamental innovation of 14th-century commentators, one which, as neither Maier nor Murdoch recognised, can be traced back with some precision to Walter Burley's latest *Physics* commentary on the one hand, and to John Buridan's, Nicole Oresme's and Albert of Saxony's *Physics* commentaries on the other hand, is the definitive emergence[474] and the application to the debate on *minima naturalia* of temporally extended conceptions of the unfolding of substantial change (therefore conceptions considering the substantial change of homogeneous material substances as a process taking place through an extended interval of time). This aspect will be dealt with extensively in the last part of the chapter, where I will also show in what way Burley's model is fundamentally different from the one adopted by Buridan, Oresme and Albert of Saxony. More specific points of disagreement will be shown in the discussion of individual authors throughout the chapter (for instance, I reject Murdoch's idea that Boethius of Dacia's discussion of *minima naturalia* amounts to a full-fledged denial of their existence). As a final remark, it should be noted that, even when I agree with Maier and/or Murodch, the publication of a significant amount of new critical editions of Medieval Latin *Physics* (and *De generatione*) commentaries in the last few years fully justifies an update of their conclusions in light of the imposing body of newly available textual evidence.

2.7. The Early Medieval Latin Debate on *Minima naturalia*: The Emergence of a Set of Alternative Positions

One of the most noteworthy features of the early 13th-century reception of the issue of *minima naturalia*, especially in the Oxford tradition, is the fact that the Averroistic (and earlier Philoponean) dichotomy between a body *qua* continuous magnitude and a body *qua* material substance (together with Averroes' strong metaphysical conception of *minima naturalia*) soon came to be challenged. This led to

[473] Using an expression popularised by John Murodch (cf. J.E. MURDOCH, "Propositional Analysis in Fourteenth-Century Natural Philosophy: A Case Study", *Synthese* 40, 1979, pp. 117-146) and Simo Knuuttila (cf. S. KNUUTTILA, *Remarks on the Background of the Fourteenth Century Limit Decision Controversies*, in M. ASZTALOS (ed.), *The Editing of Theological and Philosophical Texts from the Middle Ages. Acta Universitatis Stockholmiensis (Studia Latina Stockholmiensia 30)*, Stockholm, Almqvist and Wiksell, 1986, pp. 245-266.

[474] Although there are scattered precedents in the 13th century, as I will show below and in Chapter 4.

the development of a series of alternative and highly original conceptions of *minima naturalia*. There is, however, at least an apparent exception to this trend, so that, before turning to the alternative conceptions of *minima naturalia* developed in the early commentary tradition on the *Physics*, it is important to look at such an exception, i.e., Adam of Buckfield (ca. 1220–1279/92), a master of Arts active at Oxford around the mid-13th century, probably from 1240, who commented largerly on Aristotle's treatises of natural philosophy and who is a key witness of their early reception in the Latin West.

2.7.1. Adam of Buckfield: An Early Adherent of *Minima secundum formam*

Adam of Buckfield is probably one of the first Oxford masters to have left commentaries on the *Physics* and on the other Aristotelian *libri naturales*, so that his commentaries might seem to represent a good starting point to study the Medieval Latin debate on *minima naturalia* at Oxford around 1250 (his commentaries can, for the most part, be probably dated to the 1240s[475]). Nevertheless, most of his commentaries[476] – which, however, remain mostly unedited and barely studied - are mainly aimed at elucidating the Aristotelian text, largely lacking in-depth analyses of the problems raised by Aristotle's discussion. As a result, no specifically recognisable doctrine of *minima naturalia* can be found in such commentaries[477].

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[475] Cf. J. BRUMBERG-CHAUMONT, *English Commentaries from the First Half of the Thirteenth Century: tradition and Doctrines*, in J. BRUMBERG-CHAUMONT, D. POIREL (eds.), *Adam of Bockenfield and His Circle on Aristotle's* De memoria et reminiscentia *(Auctores Britannici Medii Aevi 37)*, Oxford, Oxford University Press, 2021, pp. 32-34.

[476] This is certainly the case of his *Physics* commentaries and of the relevant sections of the *De generatione* ones, although, as I will show in the next chapter, not the case of the *De sensu* commentaries attributed to Buckfield.

[477] Cf., for instance, Buckfield's presentation of the second and the third arguments employed by Aristotle against Anaxagoras' twin theses that everything is present in everything and that everything comes to be out of everything in *Physics* I.4: "Consequenter, cum dicit: *Amplius autem*, ponit secundam rationem ad idem, que concludit quod in nullo finito possunt esse partes infinite secundum quantitatem, quod tamen posuit Anaxagoras. Et est ratio hec: totum sequitur partes secundum quantitatem in finitate et infinitate, in determinatione et indeterminatione; si igitur totum compositum ex partibus impossibile est esse infinitum, quod manifeste patet, et partes compositi impossibile est esse infinitas; si enim partes essent infinite, necesse est totum infinitum esse. Rationis huius primo ponit maiorem et exponit quedam dicta in ipsa, scilicet quomodo sumit partes, cum pars dicatur multipliciter. Et patet. Secundo, cum dicit: *Si autem impossibile*, ponit minorem. Tertio, cum dicit: *Manifestum est*, infert conclusionem. Quarto, cum |f.10rb| dicit: *Erit enim*, innuit verificationem consequentie necessitatis. Ultimo, cum dicit: *Caro autem et os*, manifestat in terminis (?) qualiter sequitur sua conclusio. Et patet. Consequenter, cum dicit: *Amplius si omnia*, dat tertiam rationem que concludit non omnia esse in omnibus. Circa quam sic procedit: ponit totam opinionem Anaxagore, scilicet quod species omnium partium similium sunt simul in quolibet et quod non sit generatio proprie, scilicet per transmutationem, sed solum per segregationem partium ab eo in quo sunt in actu, et quod res denominatur a dominante in ipsa, et etiam quod quidlibet generatur ex quolibet per

Nevertheless, there is at least a text where Buckfield does present a specific view on *minima naturalia*, that is, his *Quaestio de augmento*, i.e., an independent *quaestio* (actually a series of four *quaestiones*, the last one being incomplete) concerning *De generatione* I.5. The text, only extant in one manuscript, ms. Oxford, Bodleian Library, Digby 55, ff. 119vb-120vb (dating presumably to the beginning of the 14th century), has received a recent edition[478]. In the third *quaestio, Queritur de hoc quod dicit quamlibet partem auti esse autam*, Buckfield discusses a problem related to Aristotle's statement, in *De generatione* I.5, 321a3, that, indeed, in augmentation every part is augmented. Buckfield starts by presenting an argument according to which, if this is the case, then it will not be true that in the substance undergoing augmentation (Buckfield focuses on elemental and mixed homogeneous ones, such as earth and flesh) there is a *minima pars* (something that Buckfield accepts on the authority of Aristotle's texts and, presumably, of Averroes' ones). Indeed, if it were so, insofar as a minimal part of a substance cannot be augmented through the "addition" of a smaller part than itself (since, by definition, there can be no part smaller than it), then it will be augmented by a part equal or greater than it. Still, given that any part greater than the minimal is a multiple of it (Buckfield is here presumably conceiving minimal parts as akin to numerical units, as he will later say in the *quaestio*[479]), it follows that all that is augmented is augmented by a multiple of (the

segregationem, ut quod ex carne segregatur aqua et caro ex aqua. Illud totum fuit opinio Anaxagore. Huic toti coniungit unam propositionem necessariam, et est quod omne corpus finitum tandem consumitur per exitum corporis finiti ab eo multotiens. Istud totum, scilicet propositionem necessariam cum opinione Anaxagore, facit antecedens ex quo concludit oppositum positioni Anaxagore, scilicet quod non contingit quodlibet esse in quolibet. Et verificat necessitatem consequentie cum dicit: *Remanet enim*, sic: sumatur aliquod corpus finitum, ut aqua, et ex illa segregetur (*ms*. segregatur) caro et iterum ex illa aqua, et iterum caro; necesse est partem posterius resolutam semper esse minorem parte prius resoluta. Illud tamen non procedit in infinitum, quia quantitas carnis determinata est, ita quod in minore non possit salvare speciem carnis; cum igitur perventum (*lac. ms*.) fuit ad carnem minimam, aut stabit segregatio aut non. Si autem stat, ita quod ex aqua resoluta ex carne minima non possit iterum caro segregari, eo quod caro posterior esset mi|f. 10va|nor carne que ponitur esse minima, si ita sit, habetur propositum, scilicet quod non omnia sunt in omnibus. Si autem non stat segregatio, sed ponatur adhuc resolutionem fieri in infinitum, tunc cum caro posterius resoluta non possit esse minor carne minima ad quam perventum est, erit equalis ei, quare, si segregatio procedat in infinitum, in aliquo finito et terminato secundum magnitudinem, ut in carne minima, erunt magnitudines equales secundum magnitudinem et finite, infinite tamen secundum numerum, quod est impossibile. Necesse est igitur segregationem stare cum perventum ad carnem minimam (*ms*. manifestam), et ita habetur propositum" (ADAM DE BUCKFIELD, *Sententia super Physicam Aristotelis*, ms. Madrid, Biblioteca Nacional, 1580, ff. 1ra-115vb, here f.10ra-va, I quote from a transcription by Silvia Donati, whom I wholeheartedly thank for having granted me access to the text).

[478] Cf. O. WEIJERS, *La* Quaestio de augmento *d'Adam de Bocfeld*, in G. MARCHETTI, O. RIGNANI, V. SORGE (eds.), Ratio et superstitio. *Essays in Honor of Graziella Federici Vescovini*, FIDEM, Louvain-la-Neuve, 2003, pp. 243-262.

[479] Cf. *infra*.

sum of) its minimal parts, something that appears to be false. More relevant here than Buckfield's discussion of this argument, and even of the solution to the issue he provides, is the way in which, after introducing this argument, he characterises the *minima pars* of a homogeneous substance. As he says:

> There is, indeed, a minimal part (*minima pars*) of earth of which there is no smaller one in the species of earth; and if such a part were divided, earth would not remain but it would be corrupted. Even though, however, every continuum is infinitely divisible, earth is not divisible in infinite parts according to form (*secundum speciem*). Hence Aristotle: the nature of all permanent entities has a limit and a proportion of magnitude and of augmentation [cf. *De anima* II.4, 416a16-17][480].

Of course, the passage is extremely short, and it does not allow to say much about Buckfield's conception of *minima naturalia*. One thing that can certainly be determined, however, is that he is here clearly resorting to a notion of *minima secundum formam* for homogeneous material substances. Indeed, he clearly admits that, by a progressive process of separation of the parts of a homogeneous material substance, below a certain threshold of smallness the substantial form of the substance itself cannot persist in existence and is therefore corrupted. True, Buckfield does not state this view in Averroes' more explicit terms (and in the more explicit terms that would be later adopted by subsequent Latin commentators endorsing the same view). Nevertheless, the gist of the view is clearly present in the text. This should not come as a surprise, if one considers the role that Averroes (as a guide to Aristotle) plays in this text and in many parts of Buckfield's *corpus*[481].

One final aspect of Buckfield's view that is worth underlining here concerns the fact that, contrary to any possible "corpuscularian" understanding of his *minima secundum formam* (an understanding that the very way of presenting the discussion might suggest), such *minima* are only potentially present within the whole to which they belong

[480] ADAM DE BUCKFIELD, *Quaestio de augmento*, q. 3, in WEIJERS, *La* Quaestio de augmento *d'Adam de Bocfeld*, *op. cit.*, p. 258: "Est enim minima pars terre qua non est minor in specie terre; que si divideretur, non remaneret terra sed corrumperetur. Quamvis tamen omne continuum sit divisibile in infinitum, non est terra divisibilis in partes infinitas terre secundum speciem. Under Aristoteles: omnium natura constancium terminus et ratio magnitudinis et aumenti."

[481] Cf., for instance, the examples provided by Weijers in her own introduction to the text (WEIJERS, *La* Quaestio de augmento *d'Adam de Bocfeld*, *op. cit.*, pp. 243-252).

and they can only be actualised by a process of progressive division (intended as a "physical" separation):

> And if those minimal parts were all imagined existing in their whole discontinuous between each other (*discrete adinvicem*), such as unities in number, and in this way is attributed to them augmentation, there would be as many augmentations as [there are] parts, and in this way the whole would be augmented in the double or in a greater [multiple], such as the abovementioned argument claims [i.e., the one that I have presented above and from which the *quaestio* stems]. But that imagination is false; in augmentation, indeed, those minimal parts are in the whole in potency (*secundum potentiam*), whereas the parts composed [by them] are in act, and therefore the minimal parts are not augmented if not *per accidens*, such as the other argument claims[482].

As the passage makes clear, since their very beginning (or in any case since their very early phases) Medieval Latin discussions of *minima naturalia* always took as a presupposition the belief in the (potential) infinite divisibility of material substances according to their matter. As a result, Medieval Latin commentators, since the mid-13th century, clearly distinguished *minima naturalia* from any sort of "atoms" or "corpuscles", and they severely criticised any view conflating these distinct (and incompatible) notions. Any "corpuscularian" use of *minima naturalia* (and of *minima sensibilia*, as the next chapters will show), rather than originating from any kind of conceptual confusion in this respect, took this fundamental distinction as an unavoidable starting point.

2.7.2. Richard Rufus of Cornwall (?)'s *In Physicam Aristotelis*: An Argument against Intrinsic *Minima naturalia* from the Definition of Homogeneous Bodies

Unfortunately, not only Buckfield's ones, but most of the other commentaries related to this first phase of the reception of the *Physics* remain unedited and barely studied. One notable exception is the commentary published in 2003 under the title of *In Physicam Aristotelis* and attributed by its editor, Rega Wood, to Richard Rufus of

[482] ADAM DE BUCKFIELD, *Quaestio de Augmento*, q. 3, in WEIJERS, *La* Quaestio de augmento *d'Adam de Bocfeld*, *op. cit.*, p. 259: "Et si ymaginarentur ille partes minime omnes existentes in suo toto discrete adinvicem, ut unitates in numero, et sic attribuitur eis aumentatio, essent tot aumenta [quod *exp*.] quot et partes, et sic aumentaretur totum in duplum et in maius, ut velit predicta ratio. Sed illa ymaginatio falsa est; in augmento enim sun tille minime partes in toto secundum potentiam, alie autem partes composite sunt in actu et ideo minime partes non augmentantur nisi per accidens, sicut voluit alia ratio."

Cornwall (*fl.* 1231-1255), a philosopher and theologian who taught both at Paris and Oxford, although the attribution has been challenged multiple times after its publication[483]. The commentary, due to its "archaic" structure[484], represents an important early witness to the reception of the *Physics* and also, it goes without saying, to the debate on *minima naturalia*, possibly representing the earliest extant Latin discussion of the issue in a *Physics* commentary[485]. In the commentary, the issue of *minima naturalia* is raised

[483] RICHARD RUFUS OF CORNWALL, *In Physicam Aristotelis (Auctores Britannici Medii Aevi 16)*, ed. R. WOOD, Oxford, Oxford University Press, 2004. On the attribution of the work to Rufus, see especially by E.D. SYLLA, "Review to 'Richard Rufus of Cornwall. *In Physicam Aristotelis. Auctores Britannici Medii Aevi XVI*'", *Notre Dame Philosophical Reviews*, available online at https://ndpr.nd.edu/news/richard-rufus-of-cornwall-in-physicam-aristotelis-auctores-britannici-medii-aevi-xvi/, 2004.08.09, last consulted on January 31st, 2023, and S. DONATI, "The Anonymous Commentary on the *Physics* in Erfurt, Cod. Amplon. Q. 312 and Richard Rufus of Cornwall", *Recherches de théologie et philosophie médiévales* LXXII, 2005, pp. 232-362. Although Wood replied extensively to the objections of both scholars (cf. R. WOOD, "Reply to '*Review* by Edith Sylla, Notre Dame Philosophical Reviews 2004.08.09'", available online at https://rrp.stanford.edu/Reply-Sy.shtml, 2007, last consulted on January 31st, 2023, and R. WOOD, "The Works of Richard Rufus of Cornwall: The State of the Question in 2009", *Recherches de Théologie et Philosophie médiévales* LXXVI, 2009, pp. 1-73), it seems hard to deny that at least some of them remain unanswered. As such, the attribution of the commentary cannot be taken as more than probable. Of course, since the *Physics* commentary in Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 4° 312 (the only witness of the commentary) has been written by an English hand at Oxford, its link with the Parisian Faculty of Arts depends on its attribution.

[484] Cf. C. TRIFOGLI, *Oxford Physics in the Thirteenth Century (ca. 1250-1270). Motion, Infinity, Time and Place (Studien und Texte zur Geistesgeschichte des Mittelalters 72)*, Leiden-Boston, MA-Köln, 2000, p. 31.

[485] This represents, nevertheless, a controversial issue. Apart from the controversies surrounding the attribution of the commentary to Rufus (indeed, both Sylla and Donati, while strongly criticising the arguments for the commentary's attribution to Rufus and its Parisian origin, do not openly dispute the fact that the redaction of the commentary belongs to the first half of the 13th century, and more precisely around 1240), a second problem remains. It must be noted, indeed, that in a brief *summa* of the *Physics* attributed to Robert Grosseteste, the problem of *minima naturalia* is presented, at the end of the section concerning *Physics* VI, by adopting the Philoponean-Averroistic dichotomy between a body *qua* material substance and a body *qua* continuous magnitude. The commentary has been taken as spurious by L. BAUR, *Die Philosophischen Werke des Robert Grosseteste, Bischofs von Lincoln*, Münster i.W., Aschendorff Verlag, 1912, pp. 19-24, and by the majority of contemporary scholars as well. Nevertheless, it is to be noted that S. HARRISON THOMSON, "The *Summa in VIII Libros Physicorum* of Grosseteste", *Isis* 22 (1), 1934, pp. 12-18, replied quite forcefully to Baur's reasons for taking the commentary as spurious. His arguments, although rejected by R.C. DALES, "The Authorship of the *Summa in Physica* Attributed to Robert Grosseteste", *Isis* 55 (1), 1964, pp. 70-74, still bear some weight. A modern edition with Spanish translation has been published as ROBERTUS GROSSETESTE, *Suma de los ocho libros de la Física de Aristóteles (Summa Physicorum)*, texto latino, traducción y notas de J.E. BOLZÓN y C. LÉRTORA MENDOZA, Buenos Aires, Editorial Universitaria, 1972. Significantly, however, in the glosses on the *Physics* safely ascribed to Grosseteste, edited as ROBERTUS GROSSETESTE, *Commentarius in VIII Libros Physicorum Aristotelis*, ed. R.C. DALES, Boulder, CO, University of Colorado Press, 1963 (a new edition is in preparation by Neil Lewis and Peter King) and universally ascribed to Grosseteste, although a section of the text is devoted to *Physics* I.4, no mention of the issue of *minima naturalia* can be found. The absence can be explained by the fact that the bulk of the commentary (better, of the preparatory notes that Grosseteste was taking for his never achieved full commentary on the *Physics*) was composed between 1228-1232, that is before Grosseteste had the opportunity to read Averroes' *Long Commentary* on the *Physics*. This fact alone, whether one takes the *Summa* to be an authentic work or not, should help in showing that the reception of Averroes' *Long Commentary* was a decisive factor in making the debate on *minima naturalia* in the Latin West possible at all.

as a *dubitatio* on the Aristotelian text. It is worth remarking from the outset that, although the author of the commentary was by all evidence familiar with Averroes' *Long Commentary*, he did not make use neither of his discussion of *Physics* I.4 or of his theory of *minima naturalia* as developed in the commentary on subsequent books of the *Physics*.

Rather, the commentator is sceptical of the existence of *minima naturalia* in homogeneous material substances. Indeed, he remarks:

> It is doubted about the third response whether there is a minimal flesh. Flesh indeed is homogeneous, thus it has parts of the same nature with the whole, therefore it is divisible in [pieces of] flesh. Then, let us take the minimal flesh. Then [things are] so: in this flesh there are the four elements. Let us take the halves of that flesh. Then [things are] so: what is the proportion of those wholes one towards the other, the same is [that] of their halves; but the proportion of the wholes could make [this body] flesh; thus also the proportion of the halves. And so this latter flesh is smaller than the former, which, nevertheless, was taken to be the minimal [flesh][486].

The commentator's reasoning employs the same argumentative strategy used by Aristotle in arguing for the existence of *minima naturalia*, i.e., that of moving from living beings as wholes to inanimate homogeneous material substances as their proper parts (cf. *Physics* I.4, 187b13-21). However, the commentator shows that, once the strategy is applied directly to inanimate homogenenous substances (and especially to what is taken to be their *minimum*), it is self-defeating. Indeed, if one takes what is, *ex hypothesi*, the *minima caro* (or the *minimum* of any other homogeneous substance), this should still be an extended entity. If this is so, however, it will have parts that have the same composition of the whole, by the very definition of a homogeneous material substance. If, then, such a *proportio* makes the whole a piece of flesh and not, for instance, of bone, also the proper parts of the *minima caro* must still be flesh, and not something else (or no substance at all). However, if this is so, there will be pieces of flesh which are smaller than the *minima caro*.

The peculiarity of this argument is, evidently, the fact that hylomorphism does not play a role in it. Indeed, the composition of a material (homogeneous) substance to which

[486] RICHARD RUFUS OF CORNWALL, *In Physicam Aristotelis*, ed. WOOD, p. 101, l. 158-p. 102, l. 166: "Dubitatur super tertia responsione, an sit caro minima. Caro enim est homogeneum, ergo habet partes eiusdem naturae cum toto, ergo est divisibilis in carnes. Item, sumatur minima caro. Tunc sic: In hac carne sunt quattuor elementa. Sumatur medietates illius carnis. Tunc sic: Quae est proportio illorum totorum ad invicem, eadem est suarum medietatum; sed proportio totorum potuit facere carnem; ergo et proportio medietatum. Et sic haec ultima caro erit minor quam prima, quae tamen fuit minima secundum positionem."

the *In Physicam* refers seems to be not that between matter and substantial form, but rather the proportion of the four elements that determine the nature of the substance as a "mixed" one. This is a curious fact, one which will make the argument almost disappear after the early stages of the reception of the *Physics* in the Latin West (although it will keep playing a role, in a reformulated version, in the Medieval Latin debate on *minima sensibilia*, as I will show in the next chapters).

On the contrary, one aspect of the commentary's discussion of *minima naturalia* which will have a long posterity throughout the 13th and the 14th century is the fact that, instead of trying to find a reply on Aristotle's behalf to the objection just discussed, the *In Physicam* takes it as conclusive and, as a consequence, in order to save Aristotle from having maintained something which is evidently false (i.e. the existence of *minima naturalia* in inanimate homogeneous substances), it suggests that this was not Aristotle's view:

> It must be said that [Aristotle] does not claim [cf. *Physics* I.4 187b13-21; 187b30; 188a1] that flesh is minimal because this is according to the truth, but rather because Anaxagoras should have said it. Indeed, he posits that there is flesh where flesh has been more evident to the sense. Thus because the *minimum* is according to the sense, then it will only be according to it[487].

According to the *In Physicam*, what Aristotle was really saying was that Anaxagoras, in order to be fully consistent with his natural philosophy, had to admit the existence of *minima naturalia* for inanimate homogeneous substances and, since this conclusion is evidently false, so is the theory from which it stems. This argument is based on a passage belonging to the same chapter of the *Physics* (I.4, 187b2-7), already mentioned and discussed above. Indeed, while introducing Anaxagoras' position, Aristotle notes that, in order to explain why things appear different, although everything is present in everything, Anaxagoras maintained that a substance appears to us according to what is present in it in greater quantity. For instance, flesh appears flesh and not bone, or water, because flesh is its predominant constitutent. Now, the *In Physicam* notes that Anaxagoras is thus claiming that what we perceive as flesh is for the most part composed of flesh, i.e., that

[487] RICHARD RUFUS OF CORNWALL, *In Physicam Aristotelis*, ed. WOOD, p. 102, ll. 167-171: "Dicendum quod non dicit carnem esse minima quia ita sit secundum veritatem, sed quia sic oportuit Anaxagoram dicere. Ille enim ponit hic esse carnem, ubi caro fuit magis apparens sensui. Quia ergo minimum est secundum sensum, minimum erit simpliciter secundum eum."

the flesh it contains is *the thing which we maximally perceive among its infinite components*. If, however, Anaxagoras admits that there is a *maximum* in perception, he must also assume that there is a *minimum* in perception, since the two are contraries[488]. Still, if there is a *minimum* in perception, it means that it is not true anymore that everything is present in everything, else it would still be possible to perceive the maximal component of the substance considered. It is this claim that, according to the *In Physicam*, Aristotle thinks Anaxagoras should adopt, with the consequence of making his overall natural philosophy inconsistent.

Apart from the reconstruction of the commentator's reasoning, what is most important to remark here is that, in this passage, although only with reference to Anaxagoras' own theory, a new idea, that of a *minimum naturale secundum sensum* (that is, the smallest quantity of a substance that the senses are able to perceive) makes its appearance in the Latin debate on *minima naturalia*. As it will be shown below and in the next chapters, this conception, applied directly to Aristotelian *minima naturalia* (and also to *minima sensibilia*), would have also had an important posterity in the later Oxford commentary tradition of the 13th century and even well within the 14th century.

2.7.3. Pseudo-Roger Bacon's *Questiones supra libros quatuor Physicorum Aristotelis*: The *Minima secundum operationem*

Probably the Latin discussion of *minima naturalia* closest – from a chronological point of view – to that of the *In Physicam* is found in the *Questiones supra libros quatuor Physicorum Aristotelis*, a work traditionally ascribed to Roger Bacon (1214/1220-1292), being a *reportatio* of his first cycle of lectures on the *Physics* during his first Parisian period (ca. 1240-1247) when Bacon was a master at the Faculty of Arts before joining

[488] This step of the argument is implicit in the *In Physicam*'s formulation, unless one takes the sentence "[q]uia ergo minimum est secundum sensum, minimum erit simpliciter secundum eum" to present a scribal misreading, so that the original text should be "quia ergo *maximum* est secundum sensum, minimum erit simpliciter secundum eum" (I am very grateful to Cecilia Panti for having remarked that this needs not be the case, since it is perfectly possible to provide a consistent interpretation of the sentence in the wider context of the discussion even as it stands). Be that as it may, it is worth noting that the argument is not valid, since it plays on a semantical ambiguity. Indeed, what is *magis apparens sensui* is a *maximum* only in a relative sense, i.e., compared with what, in a given material substance, is less apparent to the senses. The meaning of *maximum* which, however, would ensure the validity of the argument is an absolute one, i.e., the claim that there is a maximal quantity of a given material substance beyond which we do not perceive anything at all.

the Franciscan Order[489]. It is doubtful whether the work is authentically Bacon's, as has been convincingly argued by Silvia Donati on multiple grounds (paleographic, stylistic and doctrinal)[490]. In what follows, I will therefore consider the work as anonymous.

The author of the commentary, while discussing *Physics* I.4, takes an apparently more conventional route than the one taken in the commentary attributed to Richard Rufus of Cornwall, since he presents both elements that characterise Averroes' solution to the issue of *minima naturalia*. First, he introduces the Philoponean-Averroistic dichotomy between a substance *qua* (continuous) magnitude and a substance *qua* hylomorphic compound and then he associates the latter case to the doctrine of *minima secundum formam*:

> Solution: to this it must be said that it is possible to speak in two ways about a body; in one way insofar as it is continuous, and so it cannot be consummated, such as the first argument demonstrates; in another way insofar as it is natural, and in this way it can be consummated, and this is insofar as it is under a species or form[491].

The commentator, however, does not consider this solution sufficient to settle the issue. Indeed, in one of the last remarks dedicated to *Physics* I.4, the author of the commentary notes:

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[489] (PSEUDO-)ROGERUS BACON, *Questiones supra libros quatuor Physicorum Aristotelis (Opera hactenus inedita Rogeri Baconi Fasc. VIII)*, ed. F.M. DELORME, with the collaboration of R. STEELE, Oxford, Clarendon Press, 1928.

[490] Cf. S. DONATI, *Pseudoepigraphia in the* Opera hactenus inedita Rogeri Baconi*? The Commentaries on the* Physics *and on the* Metaphysics, in J. VERGER, O. WEIJERS (eds.), *Les débuts de l'enseignement universitaire à Paris (1200-1245 environ) (Studia Artistarum 38)*, Turnhout, Brepols, 2013, pp. 153-203. Although I take most of Donati's arguments to be convincing, I have to note here that the debate is still open and that no significant response to Donati's thesis (either positive or negative) has to date appeared in print, apart from an endorsement by Dragos Calma (cf. D. CALMA, "Adam of Bocfeld or Roger Bacon? New Remarks on a Commentary on the *Book of Causes*", *Recherches de Théologie et Philosophie médiévales* LXXXV, 2018, pp. 71-108, esp. p. 83).

[491] (PSEUDO-)ROGERUS BACON, *Questiones supra libros quatuor Physicorum Aristotelis*, ed. DELORME with the collaboration of STEELE, p. 22, ll. 11-19: "SOLUTIO: ad hoc dicendum quod de corpore contingit loqui duppliciter; uno modo in quantum est continuum, et sic non potest consumi, sicut probat argumentum primum; alio modo in quantum est naturale, et hoc modo potest consumi, et hoc est eo quod est sub specie vel forma. Unde corpus habens speciem naturalem sive formam non est divisibile in infinitum in quantum tale; et hoc est quia divisio non est ei respectu speciei vel forme, set respectu continuitatis corporis." The position is restated in the commentary on *Physics* III, where the author of the commentary additionally notes that that there are limits to the actual division of matter as well in material substances: "SOLUTIO: ad hoc dicendum quod corpus sensibile continuum dupliciter consideratur; uno modo ratione qua continuum, et sic divisibile est <in> infinitum, quia continuum non fit ex indivisibilibus set ex partibilibus, et hujus ratio est quia componentia aliquod corpus continuum integrantia simul debent esse et se invicem tangere. […] Alio modo consideratur continuum sensibile ratione qua naturale est et sensibile, et hoc modo materia et forma determinatur et ex illis componitur; et hoc modo non est in infinitum in dividendo abire, set stare est ad materiam et formam, ut jam videbitur" (*ibid.*, p. 152, ll.15-20; ll. 25-30).

> Here it can also be asked to which [constituent] it is due that the dissolution of a natural body stops, i.e., whether insofar as matter or insofar as form; and, if [the cause is] on the side of form, [whether] insofar as it gives being or <insofas as> it is the principle of operation; and, if in both ways, whether there is a station insofar as it is the principle of operation because it cannot operate further, or because it finds a proportional [body] which resists it; but, simply omitting these [things] for now, we will speak about them in the chapter on infinity [cf. the commentary on *Physics* III.4-8][492].

The displacement of the discussion of *minima naturalia* to the commentary on Book III is an unusual choice, even more so given that the discussion, in that context, is extended and articulated. Indeed, after having stated that a *corpus naturale* (or *sensibile*), insofar as it is *naturale*, is not infinitely divisible, the author considers whether this is because of a limit to division on the side of matter or on the side of form, and, if the latter, whether it is a limit due to the impossibility of forms to be united to extremely small quantities of matter, or rather a limit due to the impossibility of forms to operate when united to extremely small quantities of matter. In concluding for the last view, the author of the commentary characterises the issue of *minima naturalia* in inanimate homogeneous substances in the following way:

> If, however, there were a mixed body similar in species, or homogeneous such as flesh, then there would not happen to be a station [to its increase and decrease in size] on the side of matter, nor on the side of form insofar as it gives being, if not in the upper [limit], but in the lower [limit], or in dividing it there would happen to be a station insofar as it is the principle of operation, and this because it cannot operate further. And note that the operation is twofold; one is animal (*operatio animalis*), such as to alter sense, and in this way there <is> said to be a station in the sensible's form, because at such a quantity the sensible alters the sense, but at a lesser [quantity] it could not operate on the sense or alter it; the other is the natural operation (*operatio naturalis*), such as to convert food, and in this way it is said that flesh at such a determinate quantity converts food, and if it were at a lesser [quantity], it could not operate[493].

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[492] (PSEUDO-)ROGERUS BACON, *Questiones supra libros quatuor Physicorum Aristotelis*, ed. DELORME with the collaboration of STEELE, p. 23, ll. 12-19: "HIC ETIAM posset queri: ad quid stet resolutio corporis naturalis utrum scilicet ad materiam vel ad formam; et, si a parte forme, ut dat esse aut <ut> est operis principium; et, si utroque modo, utrum ut est operis principium sit status, quia amplius non potest operari, aut quia invenit proportionale sibi resistens; set ista ad presens omittentes simpliciter, in *capitulo de infinito* de hiis inquiremus" (emphasis in the original).

[493] (PSEUDO-)ROGERUS BACON, *Questiones supra libros quatuor Physicorum Aristotelis*, ed. DELORME with the collaboration of STEELE, p. 156, ll.3-15: "Si autem sit corpus mixtum simile in specie, vel ommogenium ut caro, tunc non contingit stare a parte materie, nec a parte forme ut dat esse, nisi in suppremo, set in infimo vel dividendo contingit stare ut est operis principium, et hoc quia amplius operari non possit. Et NOTA quod duplex est operatio; quedam animalis, ut inmutare sensum, et hoc modo dicitur quod <est> stare in forma sensibilis, quia sub tali quantitate sensibile immutat sensum, et sub minori non posset operari in sensu vel inmutare; alia est operatio naturalis, ut convertere nutrimentum, et hoc modo dicitur quod caro sub tali quantitate determinata convertit nutrimentum, et sub minori, si esset, hoc operari non posset." Such a doctrine regarding *minima naturalia* is shared by at least another unedited English *Physics* commentary of the middle of the thirteenth century, i.e., the author of the anonymous *Quaestiones super Physicam* (Books I-IV), preserved in ms. Cambridge, Gonville and Caius College, 367 (589), ff.

This is probably the earliest statement, in the extant Latin commentaries on the *Physics*, of another important 13th-century position on *minima naturalia*, which, as explained above, can be called that of *minima secundum operationem*. The idea is that a material substance, below a certain threshold of smallness, although it remains ontologically unchanged, is no more able to perform its essential operation. Nevertheless, remarkably, the commentator introduces an important distinction between two kinds of operation. The first kind is common to all substances, both animate and inanimate, and its paradigmatic (if not only) example is that of acting on the senses in order to be perceived. The second one, proper only to animate substance, i.e., to living beings, has as its paradigmatic (if not only) case that of converting food into its proper components through the process of nutrition[494].

One terminological aspect deserves, however, further discussion in order to be able to fully understand the commentator's position. Indeed, the use of a distinction between an *operatio animalis* and an *operatio naturalis* seems to prefigure a distinction that would become rather common in the theological psychology (and even the Christology) of the second half of the 13th century, that is, that between a *passio naturalis* (or *corporalis*) and a *passio animalis* (or *animae*)[495]. By and large, this distinction is meant to capture the distinction between human emotions (or, better, *passiones*) that find their origin in the body (such as, but not limited to, sensation) and those that find their origin form (or that, at the very least, include an active participation of) the soul, especially the rational soul. In this sense, it would appear that the author of the

120ra-125vb; 136ra-151vb. Moreover, as it will be shown below, the idea of a *minimum secundum operationem* will find important theoretical developments in Geoffrey of Aspall's *Physics* commentary. Although a more complete analysis would be needed before assessing the influence that the position of the *Questiones supra libros quatuor Physicorum Aristotelis* on *minima naturalia* really had on later English (specifically Oxford) *Physics* commentaries of the 13th century, it seems safe to assume that the commentary is firmly rooted in at least one line of thought of the early tradition of English Aristotelian natural philosophy, against the claim made by Trifogli, according to which the *Questiones supra libros quatuor Physicorum Aristotelis* did not exert any influence on later English *Physics* commentaries of the middle of the 13th century (cf. TRIFOGLI, *Oxford Physics in the Thirteenth Century (ca. 1250-1270)*, *op. cit.*, p. 32, n. 104).

[494] To be precise, the example provided by the author of the commentary refers to flesh as the homogeneous component of a living being; still, it is clear from the context that such an apparently ambiguous example is meant to apply to living beings insofar as heterogeneous substances.

[495] The distinction features prominently, for instance, in Aquinas' *Summa theologiae* III, q. 15, a. 4 (but see also, at least, *Quaestiones disputatae de veritate*, q. 26, a. 2). For a discussion of Aquinas' distinction in secondary literature, see, for instance, C.S. TITUS, "Passions in Christ: Spontaneity, Development, and Virtue", *The Thomist: A Speculative Quarterly Review* 73 (1), 2009, pp. 53-87, especially pp. 74-78.

commentary under discussion uses the couple exactly as the reverse of the distinction that will be later formalised in a properly psychological context. Indeed, what he calls *operatio animalis* should correspond to (what gives origin to) a *passio naturalis*, and what he calls *operatio naturalis* should rather correspond to a *passio animalis*. Still, it appears quite clearly that a similar reasoning stands behind the distinction, which, although applied both to living and non-living beings, is justified by the kind of *passio* that the operation at hand can engender in living (paradigmatically human) beings[496].

Regardless of how they are called, the two kinds of *minima secundum operationem* distinguished by the author of the commentary will have a very different posterity. Indeed, the *minimum* dependent on the second kind of operation will not have an important posterity in the Latin debate on *minima naturalia*, given its focus on living beings and, more specifically, on the powers of the (nutritive) soul, that is, on a case in which virtually no Medieval Latin commentator questioned the existence of *minima* as well as of *maxima naturalia*. The *minimum* dependent on the first kind of operation, instead, will have an important heritage in later *Physics* commentaries, insofar as it is part of the discussion over a central aspect in the Latin debate on *minima naturalia*, that is, on the question of the possibility for extremely small quantities of material substances to be perceived by the external senses. Moreover, such considerations also inextricably link the debate on *minima naturalia* with that of *minima sensibilia*, since the perception of a substantial form is always indirect, mediated by the perception of the sensible qualities of the substance concerned. In this sense, this commentary represents one of the earliest instances of a discussion that would later take centre stage in the Medieval Latin debate on *minima sensibilia*, as I will show in the next chapters, namely, the one concerning the minimal quantity of matter in which sensible qualities have the power to act on the external senses so as to engender a sensation.

Nevertheless, no explicit mention of *De sensu* 6 is made in this connection by the *Questiones supra libros quatuor Physicorum Aristotelis*, as it also was the case for the

[496] It might even be possible to hypothesise that the scribe inverted the two expressions, especially given the fact that they are not found anywhere else together in the commentary. Still another hypothesis, which has been suggested to me by Silvia Donati, is that *animalis* might constitute a palaeographical corruption of *sensibilis*. This would then imply that, although the commentator is already hinting at the same distinction that would later become common in a theological context, he is using an entirely different vocabulary to express it. It is to be remarked, in this respect, that the overall history of the origin and development of the theological couple *passio corporalis-passio animalis* in the Latin 13th century is still to be fully retraced.

Physics commentary attributed to Richard Rufus, which, as seen, discussed as well as the problem of the perception with respect to the issue of *minima naturalia*. Given the early dates of both commentaries, this might simply mean that the first Latin translation of the *De sensu*, although already completed, had not been accessed by the authors of the two commentaries. Be that as it may, the considerations on perception presented by the two commentaries are profoundly different. Indeed, as seen above, the *Physics* commentary attributed to Richard Rufus refers in particular to the fact that the senses are not able to perceive substances below a certain threshold of smallness. On the contrary, the *Questiones supra libros quatuor Physicorum Aristotelis* focuses on the inability, *on the side of the substance itself*, to act on the senses. It is this the reason why, if the considerations of the *In Physicam* go towards the idea of what I have called a *minimum secundum sensum* (a notion that will be typical of the later Oxford commentary tradition on the *Physics* and on the *De sensu*), the position of the *Questiones supra libros quatuor Physicorum Aristotelis*, not only in the case of the *operatio naturalis*, but even in the case of the *operatio animalis*, is best understood as that of a *minimum secundum operationem*, where the operation concerned is the action on the senses in perception. Interestingly, the idea that, below a certain threshold of smallness of the matter to which they are united, sensible qualities lose the power to perform their proper operation of actin on the external senses so as to engender a sensation, so that they become "inactive", is a feature typical of the later Parisian *De sensu* commentary tradition. This remark might provide additional evidence to the idea that this is, after all, a Parisian commentary entirely unrelated to Bacon[497].

[497] One example (although not originating from a *Physics* commentary) of a later view that comes close to the view of *minima secundum operationem animalem* of the *Questiones supra libros quatuor Physicorum Aristotelis* (exclusively focused on the case of sense perception) and that relies on *De sensu* 6 in order to support it is that of Richard of Middleton (ca. 1248/1249-ca. 1307/08), an English Franciscan of the second half of the 13th century who became *magister theologiae* at Paris in 1284, and who, in his *Sentences* commentary and in his three *Quodlibeta*, developed important views in metaphysics, natural philosophy and not only, creatively synthesising typical Franciscan doctrines with views taken from Aquinas and Henry of Ghent (on Richard's life, see E. HOCEDEZ, *Richard de Middleton: sa vie, ses œuvres, sa doctrine (Spicilegium Sacrum Lovaniense. Études et documents 7)*, Louvain-Paris, Spicilegium Sacrum Lovaniense Bureaux-Honoré Champion, 1925. Richard, in his third *Quodlibet* (probably dating to 1286-1287), discussing the issue of *minima naturalia* in q. 5 (*Utrum magnitudo naturalis sit divisibilis in infinitum*), states the following: "Secundo declarandum est quod magnitudo naturalis sicut magnitudo considerata in aere, et in igne, quantum ad actum essendi est divisibilis in infinitum […]. Tertio declarandum est quod quantum ad actum secundum quem (*pro*: qui) est generare sibi simile, et movere se, et movere sensum, non est divisibilis in infinitum […]. Similiter ad hoc, quod sensibile moveat sensum, requiritur virtus determinata, qua minor non posset sensum movere, et ideo posset ignis dividi in scintillas ita parvas quod minor aliqua illarum non posset per se sensum movere. Unde et Philosophus *De sensu et sensato* [cf. *De*

2.7.4. Roger Bacon: The *Minima secundum sensum*

The idea of a *minimum naturale secundum operationem* did not go unchallenged in the years around the middle of the 13th century[498]. In particular, it is to this position that the *Questiones supra libros octo Physicorum Aristotelis*[499], a *Physics* commentary dating from the late 1240s and (safely, this time) ascribed to Roger Bacon and preserved in the same manuscript as the *Questiones supra libros quatuor Physicorum Aristotelis*, objects, first in his commentary on *Physics* I.4, and later on also in his commentary on *Physics* III. Firstly, in his commentary on *Physics* I.4, Bacon straightforwardly rejects the idea of a *minimum secundum operationem* in the case of what the author of the *Questiones*

sensu 6, 445b3-446a20] videtur velle quod sensibile per divisionem magnitudinis devenit ad quantitatem, secundum quam non potest movere sensum in actu; sed tamen est sensibile in potentia ad movendum sensum, ita quod coniunctum cum alio posset movere in actu. Sic ergo patet quod sensibile potest esse ita parvum, quod quamvis esset sensibile in actu primo, inquantum habet formam ipsius sensibilis, tamen non esset actu sensibile quantum ad actum secundum, qui est movere sensum […]. Quod enim arguebatur de carne minima posset dici philosophum sic intellexisse" (RICHARDUS DE MEDIAVILLA, *Questiones Quodlibetales*, *Quodlibet* III, q. 5, Venetiis, 1509, f. 31rb-va). Richard's distinction between *minima ad actum essendi* (or *actum primum*) and *minima ad actum secundum* in the case of perception clearly comes close to the notion of *minima secundum operationem animalem* in the *Questiones supra libros quatuor Physicorum Aristotelis*, especially in that in both cases sensible qualities united to portions of extremely small portions of material substances are taken to be entirely "inactive". Moreover, as said, Richard's reliance on the discussion concerning *minima sensibilia* from *De sensu* 6 (an issue of which he shows a refined understanding, partially dependent also, directly or indirectly, on Alexander of Aphrodisias' *De sensu* commentary), in the context of discussing the problem of *minima naturalia*, is another important instance of the relevance of this text in the debate on *minima naturalia*. For more details on Richard's position on *minima sensibilia*, cf. *infra*, Chapter 4.

[498] Although the *Physics* commentary attributed to Richard Rufus does not consider any notion of *minimum secundum operationem*, the case of the *minimum secundum operationem* is discussed in the *De generatione* commentary preserved in ms. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 4° 312, and attributed to Richard Rufus. The passage concerned, taken from the commentary on *De generatione* I.5, where the author discusses the problem of growth (*augmentum*) in homogeneous bodies, is the following: "Dicitur quod est caro minima quantum ad operationem carnis, scilicet quod minor illa minoris virtutis esset, ita ut possit alimentum convertere. Et talibus et non minoribus advenit alimentum; semper tamen minus. Sed contra: Aliqua est proportio virtutis huius carnis ad virtutem passivam alimenti quod ei advenit. Medietas illius carnis – constat – habebit aliquam virtutem. Sumatur ergo aliqua pars alimenti facilis passionis quae in eadem proportione se habeat ad hanc sicut praedictum alimentum ad praedictam partem. Sequetur ergo quod sicut primum potest in secundum, ita tertium potest convertere quartum. Ergo primum non fuit minimum secundum operationem" (RICHARD RUFUS OF CORNWALL, *In Aristotelis De generatione et corruptione (Auctores Britannici Medii Aevi 21)*, ed. N. LEWIS, R. WOOD, Oxford, Oxford University Press, 2011), p. 132, ll. 435-447). Interestingly, however, the commentary identifies what the author of the *Questiones supra libros quatuor Physicorum Aristotelis* calls a *minimum secundum operationem naturalem* with a *minimum secundum operationem tout court*, and it does not discuss what the *Supra libros quatuor* calls a *minimum secundum operationem animalem*. This provides additional support to what I have already mentioned above, namely, that this latter notion of minimum secundum operationem, being exclusively concerned with living beings, did not enjoy a significant posterity, considering that the case of living beings was normally considered as unproblematic in the Medieval Latin debate on *minima naturalia* (although, as I will now show, the notion is discussed, and rejected, by Roger Bacon in his own *Physics* commentary).

[499] ROGERUS BACON, *Questiones supra libros octo Physicorum Aristotelis (Opera hactenus inedita Rogeri Baconi Fasc. XIII)*, ed. F.M. DELORME with the collaboration of R. STEELE, Oxford, Clarendon Press, 1935.

supra libros quatuor Physicorum Aristotelis calls the *operatio naturalis* (and, remarkably, referring to his same example of the conversion of food by flesh as a homogeneous component of a living being):

> The fact that it [a homogeneous material substance] is divided according to operations, appears [from the following]: such as the whole power is able to convert the whole food, so half of the power [is able] to perform half of the operation; which is the operation of the whole A towards B, the same is the operation of half towards half; but the whole can convert food, thus in a similar way the part or half the other half[500].

Bacon's argument against a *minimum secundum operationem naturalem* is based on the extension of the mereological principle of the identity of properties between a homogeneous whole and its proper parts to the case of the identity of operation of a homogeneous whole and of its proper parts. Since Bacon does not address again the case of the *operatio naturalis*[501], he evidently takes it to be not particularly problematic[502].

The situation is different in the case of the *operatio animalis*. When considering the doctrine of a *minimum secundum operationem animalem* in homogeneous substances in the *Questiones supra libros octo Physicorum Aristotelis*, Bacon does not reject it outright; rather, he modifies it in a way that allows him to present what I have called the doctrine of *minimum secundum sensum*[503], a doctrine that Bacon will adopt also in the discussion of *minima sensibilia* in his *De sensu* commentary. Bacon's position, consistent

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[500] ROGERUS BACON, *Questiones supra libros octo Physicorum Aristotelis*, ed. DELORME with the collaboration of STEELE, 32.36-33.4: "Quod dividitur secundum operationes, videtur: sicut se habet tota virtus ad conversionem totius nutrimenti, sic medietas virtutis ad medietatem operationis; que est operatio totius A ad B, eadem est medietatis ad medium; set totum potest alterare nutrimentum, ergo similiter pars vel medietas alteram medietatem."

[501] There is, however, a brief (indirect) mention of this case in the commentary on Book VII of the *Physics*, where Bacon, in the context of the discussion about the conditions of motion, states the following: "Set DUBITATUR de hac alia regula vel comparatione, scilicet quod, si aliqua virtus possit in operationem vel motum in aliquo tempore, medietas illius in medietatem poterit in tempore eodem; instantia videtur esse in augmento: quoniam sumatur aliqua pars carnis que possit convertere aliquam partem nutrimenti, tunc medietas illius carnis poterit in medietatem illius nutrimenti convertendi et medietas iterum illius partis in medietatem alterius, et sic in infinitum, et ita videtur quod non sit possibile <ponere> carnem minimam […]" (ROGERUS BACON, *Questiones supra libros octo Physicorum Aristotelis*, ed. DELORME with the collaboration of STEELE, p. 368, l. 33-p. 369, l. 6). The text, anyway, does nothing more than restating what had already been claimed in the abovementioned passage from the commentary on *Physics* I.4.

[502] As said above, this is in agreement with the general disregard for this notion in the later Medieval Latin debate on *minima naturalia*.

[503] It is noteworthy that nowhere in the *Questiones supra libros octo Physicorum Aristotelis* does Bacon explicitly refers to this kind of operation as *operatio animalis*. He, instead, limits his analysis to the case of the action of a homogeneous body on the external senses, as if it were the only case actually included in this kind of operation. This provides additional support to the idea that *animalis* is a palaeographical corruption of *sensibilis* or that, at the very least, what an *operatio animalis* truly amounts to is a mere *operatio sensibilis*.

throughout the *Questiones supra libros octo Physicorum Aristotelis*, is that a *minimum secundum operationem animalem* does not exist *a parte immutantis*, i.e., that the substantial form of a homogeneous material substance is always able to act, while united to quantities of matter of any size, contrary to what concluded by the anonymous author of the *Questiones supra libros quatuor Physicorum Aristotelis*. Nevertheless, in the specific case of perception, according to Bacon, it is possible to identify a *minimum* on the side of the perceiving substance (*a parte recipientis*, or *immutati*). Indeed, although the substantial form concerned is always able to act on the external senses through the accidental forms of its sensible qualities, the weakness of the external senses makes it impossible for them to perceive the sensible species coming from extremely small pieces of matter. This position is first presented in the commentary on *Physics* I.4:

> To the other [objection]: Aristotle does not say [it], but it is commonly said; a sensible can operate in two ways: *either by modifying its medium, on both the sensible's part and that of the sensible's species, which is the multiplication of species*[504]*, and this goes off to infinity; or on the sense's part, and in this way there is a minimum, because [the sense] only operates above a determined [quantity], because vision only sees under a determined quantity, [as is said] in the second [Book] of the Perspectiva* [cf. Ibn al-Haytham (Alhazen), *Opticae thesaurus*, II.10][505]; flesh therefore in itself is not minimal, but rather infinitely divisible[506].

The same position is restated in the commentary on *Physics* III, where it seems that it can be extended to any kind of *operatio animalis* (although Bacon, such as the author of the *Questiones supra libros quatuor Physicorum Aristotelis*, does not provide any additional example[507]):

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[504] The reference to the multiplication of sensible species in the medium is a distinctively Baconian doctrine. It is not possible to discuss it here, but see for an authoritative presentation K.H. TACHAU, *Vision and Certitude in the Age of Ockham. Optics, Epistemology and the Foundations of Semantics. 1250-1345 (Studien und Texte zur Geistesgeschichte des Mittelalters 22)*, Leiden-New York, NY-København-Köln, Brill, 1988, pp. 3-26, and the introduction of D.C. LINDBERG, *Roger Bacon's Philosophy of Nature. A Critical Edition, with English Translation, Introduction, and Notes, of* De multiplicatione specierum *and* De speculis comburentibus, New York, NY, Oxford University Press, 1983, esp. liii-lxxi.

[505] The edition consulted is ALHAZEN, *Opticae thesaurus Alhazeni Arabi libri septem, nunc primum editi*, Basileae, per Episcopios, 1572.

[506] ROGERUS BACON, *Questiones supra libros octo Physicorum Aristotelis*, ed. DELORME with the collaboration of STEELE, p. 33, ll. 25-33: "Ad aliud: non dicit Aristoteles, set communiter dicitur; set sensibile potest operari dupliciter: *aut ejus mutatione medii et a parte ipsius sensibilis et a parte speciei ipsius sensibilis que est multiplicatio speciei, et hec vadit in infinitum; vel a parte sensus, et sic est minimum, quia non operatur nisi supra terminatum, quia visus videt semper sub quantitate terminata*, in secundo *Perspective*; caro secundum se ergo non est minima, set divisibilis in infinitum" (my emphasis).

[507] The fact that no additional example is provided by Bacon, apart from the case of perception, and also the fact that Bacon discusses exclusively the case of perception not only in all the other passages concerned from his *Physics* commentary, but also in his *De sensu* commentary and in all the other passages of his

To the other [objection], [the fact that] a sensible and a natural [body] determine for them the [quantity of] matter below which they cannot operate, *is true on the side of the recipient and modified [substance], but not on the side of the modifying [substance]*[508].

corpus where he discusses the issue (see the following footnote), makes it legitimate, I believe, to take his position to apply exclusively to the case of the action of substances, through the accidental forms of their sensible qualities, on the external senses so as to engender a sensation.

[508] ROGERUS BACON, *Questiones supra libros octo Physicorum Aristotelis*, ed. DELORME with the collaboration of STEELE, p. 161, ll. 21-23: "Ad aliud, sensibile et naturale determinant sibi materiam in qua minori operari non potest, *verum est a parte recipientis et immutati, tamen a parte immutantis non*" (my emphasis). Cf. also the following passage, again from the commentary on *Physics* III: "Ad aliud dicendum quod indivisibile secundum sensum est divisibile in infinitum […]" (*ibid.*, p. 160, ll. 29-31). The same position is put forth by Bacon in his *Liber de sensu et sensato*, in the context of Bacon's discussion of *minima sensibilia* (cf. the following chapter of the thesis). Finally, another statement of the same position can be found in the *De multiplicatione specierum*: "Veritas igitur est quod divisio carnis stat secundum sensum ut minor accipi non possit sensibilis, et sic de quacunque re. Deveniatur igitur ad carnem minimam secundum sensum, et tamen hec erit secundum quantitatem divisibilem et secundum substantiam, licet sensum non possit immutare aliqua pars eius. […] Quod allegatur ex fine *Libri de sensu et sensato* nichil est, nam ibi loquitur de actione in sensum, ut patet ex conditione libri, quia loquitur de sensibilibus agentibus in sensum. Et bene concedendum est quod aliquod sensibile potest esse tam parve quantitatis quod non immutabit sensum, et tamen alterabit aerem et sensum, sed sensus non percipiet. Et sensus perceptionem dicimus eius immutationem" (ROGERUS BACON, *De multiplicatione specierum*, Pars I, cap. 4, in LINDBERG, *Roger's Bacon Philosophy of Nature*, *op. cit.*, p. 58, ll. 52-57; p. 60, ll. 68-73). Interestingly, an analogous position can be found in an anonymous and fragmentary commentary on *Physics* I-V of English origin preserved in ms. Oxford, Merton College, 272, ff. 136ra-174rb, and to be dated around 1250-1270. Indeed, in q. 27 (*Dubitatur de hoc quod [Aristoteles] supponit, carnem esse minimam*) the author of the commentary, after refuting several of the early Oxford positions on *minima naturalia*, such as that of *minima secundum operationem*, brings into the debate the *auctoritas* of *De sensu* 6, and he interprets it as simply referring to the existence of a *minimum secundum sensum* in homogeneous substances, that is, a *minimum* on the side of the perceiver (I use Silvia Donati's transcription): "Similiter dicendum est ad illud *De sensu et sensato* quod est minimum sensibile virtute et operatione solum per accidens, quia solum est defectus sentiendi ex parte nostra. Dico igitur quod non valet 'hoc non sentitur per se separatum a suo toto; ergo est sensibile per accidens', sicut non valet 'forma sita extra materiam et ab ea separata non est sensibile per se; ergo est sensibile per accidens'. Item, 'lux in sui natura non videtur propter sui claritatem, sed cum admiscetur aliene nature, igitur est visibilis per accidens', hoc non valet. Similiter, non valet 'calor solum in sole non est immutativum tactus; igitur calor eius est immutativus tactus per accidens'. Item, illud argumentum non valet, 'hoc non sentitur nisi cum alio sui generis adiunctum; ergo est per accidens sensibile', sicut non valet 'iste color non videtur nisi in lumine; igitur iste color est visibilis per accidens', sicut etiam non valet 'sensibilia communia non sentiuntur nisi per propria; ergo sunt sensibilia per accidens'; scimus enim quod sensibilia communia sunt sensibilia per se. Dico igitur quod hoc quod Aristoteles dicit, quod est sensibile minimum non solum virtute, sed virtute et actione, hoc est intelligendum per accidens, quia est defectus a parte nostra. Respondendum est igitur auctoritati primi libri *Physicorum*, quia, cum dicit Aristoteles quod est minima caro, hoc est intelligendum secundum sensum, et hoc solum secundum accidens, ut iam dictum est." The passage goes beyond Bacon's analysis inasmuch as it qualifies the notion of a *minimum secundum sensum*, being fully dependent on the limitation of the perceiver, as a *minimum per accidens*, and, at the same time, it also provides a very interesting discussion of the correct meaning of the expression of *sensibile per accidens* (a discussion which will become clearer in the discussion of Geoffrey of Aspall's *Physics* commentary below and in the next chapters of the thesis, where I will address directly the meaning of the distinction between a *sensibile virtute* and a *sensibile actione* in the context of Oxford *De sensu* commentaries). Still, what matters here is especially that this commentary helps showing the importance that the overall notion of a *minimum secundum sensum* played throughout the Oxford *Physics* commentary tradition of the 13th century. Note, finally, that the *auctoritas* of *De sensu* 6 plays a key role (differently from Bacon's *Physics* commentary) in supporting the whole idea of a *minimum secundum sensum*. The importance of this *auctoritas* for the discussion is already evident from the way in which it is introduced, earlier in the *dubitatio*, where it is referred to as a *solemnis opinio*. For a presentation of the context and the structure of the commentary, see

It is thus only *a parte recipientis et immutati* (i.e., on the side of the perceiving being, intended as the patient), and not *a parte immutantis* (i.e. on the side of the perceived substance, intended as the agent) that it is possible to claim that there is a *minimum secundum operationem animalem* in (homogeneous) material substances. In this sense, Bacon appropriates (and explicitly supports) the idea of a *minimum secundum sensum* presented in the *Physics* commentary attributed to Richard Rufus (although only as a claim that Aristotle would have charged Anaxagoras with). At the same time, he explicitly rejects the idea that the limitations in the perception of extremely small portions of (homogeneous) material substances depend on the substances themselves, as the author of the *Questiones supra libros quatuor Physicorum Aristotelis* had argued. In this sense, it is not simply true, as John Murdoch for instance recently claim, that Roger Bacon, "read rightly", denies the existence of *minima naturalia tout court* in homogeneous material substances, although he certainly denied the existence in them of any *minimum* different from a *minimum secundum sensum* as I have just described it[509].

2.7.5. Geoffrey of Aspall: The *Minima secundum actionem*

The debate on *minima naturalia* in the early Oxford *Physics* commentary tradition finds its most developed and refined presentation in the commentary on the *Physics* by Geoffrey of Aspall (d. 1287), active at Oxford between 1255 and 1265 and master of Arts by 1262. His *Physics* commentary was therefore presumably composed around 1255-

S. DONATI, "Per lo studio dei commenti alla *Fisica* del XIII secolo. I: Commenti di probabile origine inglese degli anni 1250-1270 ca. (I)", *Documenti e studi sulla tradizione filosofica medievale* II (2), 1991, pp. 361-441 and EAD., "Per lo studio dei commenti alla *Fisica* del XIII secolo. I: Commenti di probabile origine inglese degli anni 1250-1270 ca. (II)", *Documenti e studi sulla tradizione filosofica medievale* IV, 1993, pp. 25-133.

509 Cf. MURDOCH, *The Medieval and Renaissance Tradition of* Minima naturalia, *op. cit.*, pp. 111-112: "The denial of *minima naturalia* begins in earnest (as Anneliese Maier has pointed out) with Duns Scotus, although he has forerunners in this regard in those firmly rooted in the thirteenth century: such as Boethius of Dacia and read rightly, Roger Bacon. Murdoch, quoting a number of passages from the *Questiones supra libros octo Physicorum Aristotelis*, shows clearly that Bacon does not adopt any doctrine of *minima naturalia* stronger than that of *minima secundum sensum*, and, what is more, of *minima secundum sensum* that Bacon explicitly considers to hold *a parte subiecti*, not *a parte rei*, as shown above. Nevertheless, this does not amount to a full-fledged denial of *minima naturalia*, as I hope to have made clear throughout this section. The true "denial" of *minima naturalia*, as I will show below, does not even start with Boethius of Dacia and John Duns Scotus, but, rather, with Walter Burley, John Buridan, Nicole Oresme and Albert of Saxony.

1265 and it has been recently edited by Trifogli and Donati, with an English translation by Ashworth and Trifogli[510]. This commentary clearly belongs to a more developed phase of the reception of the *Physics*, compared with the Oxford commentaries analysed so far. Indeed, the *quaestiones* are much more articulate than those of the *Physics* commentary attributed to Richard Rufus and of both the *Questiones supra libros quatuor Physicorum Aristotelis* and Bacon's *Physics* commentary, also thanks to the fact that the opinions of the predecessors to be taken into account are now more numerous and more diverse. Unfortunately, lacking critical editions of most of the Oxford *Physics* commentaries of the period around the middle of the 13th century, it is difficult to assess the full extent of the debate.

Geoffrey discusses the issue of *minima* in material substances in the last two *quaestiones* on Book I, i.e., qq. 78-79[511]. Geoffrey's discussion is quite intricate, since he first discusses the problem of *minima* in the division of material substances in q. 78, listing arguments *pro* and *contra*, without, however, adding a further *determinatio* to the *quaestio*. Then, in q. 79, he discusses the problem of the existence of a *minimum grave* in material substances and, after having listed new arguments *pro* and *contra*, and presented all the alternative positions available to him, he provides the following overarching *determinatio* to the problem of *minima* in material substances:

> Another and better opinion, in my view, is that it is possible to speak of a natural thing in two ways. Either (i) of a thing such that, if it is divided, its parts remain parts only equivocally, as happens in the case of flesh. (ia) If we speak of the actual division of a thing of this kind, then it is possible to find a minimum, because the whole is a minimum since every part of flesh has sense perception when it is in the whole and is animated by the soul itself of the whole, but if it is divided from the whole, it does not have sense perception nor can it have it. (ib) If we speak of the mental division of a thing of this kind, then the reply will be the one given later. (ii) If we speak of a whole whose parts once divided are <still> univocally parts, then we can speak of a minimum in two ways: either (iia) of the minimum <required> for a power (*virtute*) or (iib) <of the minimum required> for an action (*actione*). In case (iia) it is not possible to find a minimum. Case (iib) is twofold : either (iib') we are speaking of an action that consists in giving perfection to its matter, and this is an action proper to its species, and in this case it is not possible to find a minimum; or (iib'') we are speaking of an action affecting something external. But something can act on something external to it either in virtue of a contrariety, in order to convert the other thing into its own nature, or in virtue of the suitability of a place, in order to

[510] GEOFFREY OF ASPALL, *Questions on Aristotle's* Physics *(2 vols.) (Auctores Britannici Medii Aevi 26)*, ed. S. DONATI, C. TRIFOGLI, trans. E.J. ASHWORTH, C. TRIFOGLI, Oxford, Oxford University Press, 2017. The English translation of the passages quoted are taken from this edition.

[511] Most likely, as noted by Trifogli in her *Introduction*, the *quaestiones* have been displaced by their original position in the commentary on *Physics* I.4.

> acquire a place for itself. In both cases we can speak of an action in two ways: either (iib''1) we can speak of an action that inclines towards and achieves its effect; and in this way there is a minimum, because a thing can be divided into something so small that, if it is divided into even smaller parts, none of the parts will be able to actually convert another thing into its own nature or to actually move by itself towards its place. Or (iib''2) we can speak of an action that inclines towards but does not achieve its effect; and in this way it is not possible to find a minimum, because it is not possible to divide a thing into a part so small than the part does not have a natural inclination to move towards its place and also to act on another thing in order to convert it, although that part cannot achieve its effect[512].

As is evident, Geoffrey's solution is much more refined than any of the previous ones considered in this section. After having left aside the case of heterogeneous material substances, whose "physical" separation[513] in increasingly smaller parts cannot go on below a certain threshold of smallness without that the soul, i.e., the substantial form of such substances, is corrupted, the situation is different in the case of homogeneous material substances. First of all, a fundamental point of terminology must be remarked. Geoffrey's solution of this case is, indeed, based on the distinction between *minima secundum virtutem* and *minima secundum actionem*. The distinction, in this form, cannot be found in the *Physics* commentary attributed to Richard Rufus or in the two commentaries ascribed to Bacon. Its origin, nevertheless, is explained a few paragraphs earlier by Geoffrey:

> Another opinion is that there are two kinds of minimum: either for action or for power, and that it is not possible to find a minimum for a power, but it is possible to

[512] GEOFFREY OF ASPALL, *Questions on Aristotle's* Physics, ed. DONATI, TRIFOGLI, trans. ASHWORTH, TRIFOGLI, q. 79, § 12, p. 386, l. 13-p. 388, l. 8: "Aliter dicitur sic et melius, ut mihi videtur, quod est loqui de re naturali dupliciter. Aut enim de illa re quae, si dividatur, partes manent aequivoce partes, sicut est de carne. Et si loquamur de divisione actuali huiusmodi rerum, sic est sumere minimum, quia totum est minimum quia quaelibet pars carnis, cum est in toto et animate ab ipsa anima totius, sentit; si autem dividatur a toto, nec sentit nec sentire potest. Si autem in huiusmodi loquamur de divisione mentali, dicendum sicut postea dicetur. Si autem loquamur de toto cuius partes divisae sunt partes univoce, tunc est loqui de minimo dupliciter: vel de minimo virtute vel actione. Si autem loquamur de minimo virtute, sic non est possibile sumere minimum. Si loquamur de minimo actione, tunc contingit loqui dupliciter de actione: vel de actione quae est perficere suam materiam, et haec est action suae speciei deputata, et sic non est sumere minimum; aut de actione in extrinsecus. Sed agere in extrinsecus contingit dupliciter: vel ratione contrarietatis, ut aliud convertat in sui naturam, vel ratione convenientiae cum loco, ut acquirat sibi locum. Sed sive sic sive sic, est loqui dupliciter de illa actione: vel de actione inclinante et consequente effectum, et sic est minimum, quia potest dividi in tam parva quod, si in minora dividatur, neutra pars poterit aliud convertere actu in sui naturam neque movere de se actualiter ad suum locum. Vel de actione inclinante, non tamen effectum consequente, et sic non est sumere minimum, quia non est dividere aliquid in tam parva quin semper in partibus sit inclinatio naturalis ad suum locum et etiam ut agat in aliud ut aliud convertat, licet non possit consequi effectum" (for the English translation see *ibid*., p. 387 and p. 389).

[513] Not, however, a mere "mental" division. Interestingly, the distinction between a "physical" separation of parts and a mere "mental" process of division will feature prominently in the later Medieval Latin debate on *minima sensibilia*, as I will show in the next chapters.

> find a minimum for an action. Aristotle presents this distinction in *On Sense*, in the passage "One may object" [cf. *De sensu* 6, 446a4-7], where he says that a passion is sensible in two ways, that is, either with respect to action or with respect to power. And a passion is divisible to infinity with respect to power in accordance with the division of its subject, because there is no part of a sensible passion so small that it is not sensible with respect to its power and its nature. But a passion is not divisible to infinity with respect to an action; for there is a determinate quantity such that a sensible thing of a quantity less than that quantity cannot move the senses[514].

It would be difficult to exaggerate the importance of this passage for the present thesis. In it Geoffrey not only links the debate on *minima naturalia* to that on *minima sensibilia*, but he explicitly shows that what was to become a fundamental dichotomy in the debate on *minima naturalia* is drawn from the text of *De sensu* 6, the textual *locus* of *minima sensibilia*. Of course, nowhere in *De sensu* 6 does Aristotle speak of 'virtue' and 'action', rather the fundamental distinction he adopts there, as seen above, is that between 'potency' and 'act'. Sensible qualities are infinitely divisible in potency, i.e., insofar as they are considered as parts of the whole to which they belong, but not in act, i.e., insofar as they are physically cut off from the whole to which they belong and thus acquire a separate existence.

The reason why Geoffrey presents the dichotomy as one between *virtus* and *actio* seems to originate from a peculiar reading of the *translatio vetus* of the *De sensu*, which systematically translates δύναμις as *virtus* and ἐνέργεια as *actio* in the context of *De sensu* 6, a choice which William of Moerbeke, while revising the translation in order to prepare his own *translatio nova* in the early 1260s, will not follow, translating instead δύναμις as *potentia* and ἐνέργεια as *actus*[515].

Did the choice of translation of the *translatio vetus* hinder a correct understanding of the text of *De sensu* 6? The answer seems to be fully negative. That this is so can be easily ascertained by looking at some of the glosses of the *translatio vetus* of *De sensu* 6. One particularly striking example is represented by the glosses contained in the ms.

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[514] GEOFFREY OF ASPALL, *Questions on Aristotle's* Physics, ed. DONATI, TRIFOGLI, trans. ASHWORTH, TRIFOGLI, q. 79, § 9, p. 384, ll. 18-26: "Aliter dicitur quod est minimum dupliciter: vel actione vel virtute. Minimum virtute non est possibile reperire, minimum autem actione est possibile. Et istam distinctionem dicit Aristoteles in *De sensu* et, ibi: "Obiciet autem", ubi dicit quod passio sensibilis est duobus modis, scilicet aut actione aut virtute. Et est passio divisibilis in infinitum virtute secundum divisionem subiecti, quia non est aliqua tam parva passionis sensibilis quin virtute et natura sua sit sensibilis. Actione vero non est passio divisibilis in infinitum. Est enim quantitas determinate in qua ita quod non in minori potest sensibile movere sensum" (for the English translation see *ibid*., p. 385).

[515] For a full reference to the relevant passages of the two translations of the *De sensu*, see the next chapter.

Paris, Bibliothèque nationale de France, Lat. 6560, especially at the f. 109r, where one of the hands glossing the text clearly interprets *virtus* as *potentia* and *actio* as *actus*. Many more instances of the same kind (most notably the interchangeable use of the two couple of terms in Albert the Great's commentary on *De sensu* 6) will be presented in the next chapter of the thesis. Even without considering them, in any case, it is clear enough from the text of the *translatio vetus* that the parts of a material substance that are sensible *actione* are those that can be perceived in act when they exist separately (*separatim*) from the whole to which they belong, while those only sensible *virtute* are those that can only be perceived by contributing to the perception in act of the whole to which they belong and in which they exist (*in toto*).

It seems rather the case that Geoffrey consciously chose to take advantage of the use of the term *virtus*, and especially of the term *actio*, in the *translatio vetus* of *De sensu* 6, in order to attribute to this conceptual couple an entirely new meaning, the one represented by his distinction between *minima secundum virtutem* and *minima secundum actionem*. While, intrinsically, the substantial forms of homogeneous material substances, exactly because they are homogeneous, can remain present in parts so small as to be of whatever size, thus preserving their *virtus* (i.e., the power to act), this is not so in the case of their extrinsic action. Indeed, for the substantial form of a homogeneous material substance to be able to act outside of it, be that in order to convert other substances into it (including, by all evidence, the assimilation of the external senses in perception) or to move the substance towards its natural place, a certain determinate quantity of matter is needed. Beyond that, the substantial form of the substance concerned is simply unable to act outside of itself. There is, thus, a *minimum secundum actionem* in homogeneous material substances.

Up to this point, Geoffrey's notion of *minima secundum actionem* could seem to be close to the one of the *Questiones supra libros quatuor Physicorum* Aristotelis, i.e., the one of *minima secundum operationem*. Geoffrey's discussion, however, is not satisfied with the mere notion of *minimum secundum actionem*. As the first passage quoted states, indeed, he distinguishes between two kinds of *actio in extrinsecus* of a material substance. On the one hand, there is the *actio inclinans et consequens effectum*, that is, an action which is able either to assimilate the external substance on which the substance concerned acts, or to move the substance concerned to its natural place. On the

other hand, there is the mere *actio inclinans*, that is, an action which is performed by the substance concerned but which is not able to achieve the effect aimed at, be that the assimilation of an external substance or the movement to its natural place. Geoffrey's claim is that it is possible to find a *minimum* in the case of the former kind of action, but not in the case of the latter. Indeed, beyond a certain threshold of smallness, a substance, while continuing to act on its environment, is unable to achieve any effect, due to the weakness of its power. Therefore, it is clear that Geoffrey's notion of *minima secundum actionem* is fundamentally different from the notion of *minima secundum operationem* of the *Questiones supra libros quatuor Physicorum Aristotelis*, insofar as the latter, differently from the former, claims that the substantial forms of extremely small portions of a homogeneous material substance are entirely unable to act on the outside environment, even merely to perform what Aspall calls an *actio inclinans*. On the contrary, Aspall's doctrine of *minima naturalia* (which I will refer throughout the thesis as a doctrine of *minima secundum actionem*) appears to be closer to Bacon's notion of *minima secundum sensum* that, analogously, does not admit any limit to the ability to operate of extremely small portions of material substances *a parte rei*. In a sense, the doctrine of *minima secundum sensum* might be considered a doctrine of *minima secundum actionem* restricted to the case of perception.

To summarise, Geoffrey, benefiting from Bacon's discussion of *minima secundum sensum*, was able to develop a refined account of *minima secundum actionem*. It is to be noted, although it cannot be dealt further in this thesis, that this account was to have an important influence on Oxford commentators of the second half of the 13th century (and even on later ones)[516].

The reasons for this cannot be easily determined, but, as I will show in the next two chapters, it seems that the influence of such a position depends on a more general metaphysical belief that lies at the heart of the Oxford debate on *minima sensibilia* of the second half of the 13th century as well, making its influence felt also in the early 14th century. This is the idea that all the forms of homogeneous material substances, be they substantial or accidental, are always "active", no matter how small is the portion of a homogeneous material substance in which they exist. All the limitations to their action,

[516] A significant number of examples (although taken from Oxford *De sensu* commentaries) will be discussed in the following chapters of the thesis.

according to this shared metaphysical framework, depend on the insufficiency of their power, in its turn derived from the smallness of the portion of matter in which they inhere or to which they are united.

2.7.6. The Early Medieval Latin Debate on *Minima naturalia*: A Summary

The early Medieval Latin debate on *minima naturalia*, as I have reconstructed it by looking at a selection of early *Physics* commentaries dating around the middle of the 13th century (the one attributed to Richard Rufus of Cornwall, the two ascribed to Roger Bacon, and the slightly later one by Geoffrey of Aspall, to which I have also added the *Questio de augmento* by Adam of Buckfield) already shows the emergence of most of the positions that will later take centre stage in the Medieval Latin debate on *minima naturalia*, both at Oxford and at Paris.

Adam of Buckfield, in his *Questio de augmento* (his *Physics* commentary does not present any specific doctrine of *minima naturalia*) takes a position that already shows the early influence of Averroes' doctrine of *minima secundum formam*. According to Buckfield, the forms of (homogeneous) material substances metaphysically determine the minimal quantity of matter which they can inform. Also, connectedly, Buckfield's *Questio de augmento* also shows Averroes' influence in framing the debate on *minima naturalia* according to what I have called the Philoponean-Averroistic dichotomy, that is, the dichotomy between a material substance considered as a continuous magnitude and a material substance considered as a hylomorphic compound.

Averroes' influence, however, is certainly not the predominant aspect in the early Medieval Latin debate on *minima naturalia*. Indeed, all the other commentators whose positions I have analysed do not adopt the doctrine of *minima secundum formam*, rather, they all claim that the substantial forms of homogeneous material substances can exist in portions of matter however small (resorting, for the most part, to an argument based on the fact that the very definition of a homogeneous material substances entails an essential univocity between the whole and its parts). Nevertheless, they do recognise that, below a certain threshold of smallness of the matter they inform, such substantial forms might, in a relevant sense, become unable to act on the outside environment.

How, nevertheless, this inability to act is understood varies significantly between commentators. The author of a commentary falsely attributed to Roger Bacon, the

Questiones supra libros quatuor Physicorum Aristotelis, understands this inability as being a true *minimum secundum operationem*. That is to say, according to him the substantial forms of homogeneous material substances, below a certain threshold of smallness of the matter they inform, lose the power to act on the outside environment (the only case discussed by the commentator, however, is that of the action performed by such forms, through the accidental forms of their sensible qualities, on the senses so as to engender a sensation). The commentator, moreover, calls the operations performed by homogeneous material substances *operationes animales*, distinguishing them from the operations performed by hetereogeneous material substances, i.e., living beings, which he calls *operationes naturales* (and that, *a fortiori*, can only performed above a *minimum* of matter). This distinction is very important in that it prefigures, although with a different terminology, the distinction between the *passiones corporales* and the *passiones animales* (or *animae*) that will become common especially in psychological and Christological discussions in the theology of the second half of the 13th century, and whose origins still remain to be fully retraced.

Differently from (and possibly in explicit polemics with) the author of the *Questiones supra libros quatuor Physicorum Aristotelis*, Roger Bacon, in his own *Physics* commentary, claims that there is no *minimum secundum operationem* for homogeneous material substances. His argument is based on an extension on the one normally used by early Oxford commentators to deny that there is a *minimum secundum formam* in these same homogeneous material substances. That is to say, the same univocity between the whole and the parts that grounds the idea that homogeneous material substances and their parts have the same substantial form is also used to ground the idea that homogeneous material substances and their parts have the same power to act on the outside environment. Nevertheless, Bacon singles out the case of perception and he claims that, in this specific case, it is true that there is a minimal quantity of matter below which a homogeneous material substance cannot act on the senses (through the multiplication of the species of its sensible qualities) so as to engender a sensation. This is not, however, because the substance has lost the power to perform this operation. On the contrary, the substance concerned still multiplies its species in the medium but, due to its extremely small dimensions, the sensory powers are not able to perceive these species, given their intrinsic limitations. As Bacon puts it, the existence of what I have referred to as a

minimum secundum sensum does not depend on a limitation on the side of the acting substance (if not indirectly, due to its extremely small dimensions) but, rather, on a limitation on the side of the perceiving substance (i.e., of the patient).

The doctrine of *minima secundum sensum*, which was to have an important posterity in the later Oxford discussion on *minima sensibilia*, as I will show in the next chapters, did not originate, however, with Bacon. Instead, such a notion (although in an inchoate form) was already present in the (presumably earlier) *Physics* commentary attributed to Richard Rufus of Cornwall, although in that commentary the doctrine was not endorsed by the author, but rather taken as a belief that, according to Aristotle, Anaxagoras should have adopted as a consequence of his own natural philosophy, but that, at the same time, was fully incompatible with it. The (faulty) argument used by the author of the commentary is based on Anaxagoras' claim, reported by Aristotle in *Physics* I.4, according to which, although everything is present in everything, we are able to distinguish substances from each other insofar as what we perceive is the component that is maximally present in it. Still, the author of the commentary argues, if Anaxagoras posited a *maximum* in perception, he should have also posited a *minimum*. Nevertheless, if there is a *minimum* in perception, it means that in quantities of matter smaller than the *minimum* everything will not be present in everything anymore (else it would still be possible to perceive its maximal component). Of course, the argument, apart from its convoluted reasoning, is not valid, since it plays on the semantical ambiguity between a relative and an absolute notion of *maximum*.

Finally, still a different position can be found in the *Physics* commentary by Geoffrey of Aspall. Aspall, adopting a distinction taken explicitly from Aristotle's discussion of *minima sensibilia* in *De sensu* 6, 445b3-446a20, introduces in the debate on *minima naturalia* a fundamental distinction between what he calls *minima secundum virtutem* and *minima secundum actionem*. The former notion (roughly corresponding to that of *minima secundum operationem*) refers to the power to act of the material forms of homogeneous material substances, whereas the latter notion refers to the action itself of the substantial forms of homogeneous material substances (Aspall distinguishes two kinds of action: acting on another substance so as to assimilate it to the agent – this category should also include sense perception – and moving towards one's own natural place). While, Aspall claims, in homogeneous material substances there are no *minima*

secundum virtutem, insofar as their substantial forms always have the power to act on the outside environment, no matter how small is the quantity of matter they inform, there are in them *minima secundum actionem*. This does not mean, however, that the substantial forms of homogeneous material substances are not "active" at all. Rather, they always act on the outside environment, but, when informing portions of matter smaller than a given threshold, they are not able to achieve their intended effect. According to Aspall's terminology, while the substantial forms of homogeneous material substances always perform an *actio inclinans*, below a certain threshold of smallness of their matter they cannot perform an *actio inclinans et consequens effectum*. It is in this very limited sense that it is possible to identify *minima naturalia* in homogeneous material substances. Aspall's position will have a very important posterity, more than in the debate on *minima naturalia* itself, in that on *minima sensibilia*, as I will show in the next chapters.

All in all, it is clear from this overview that the importance of the early Medieval Latin debate on *minima naturalia* for the subsequent history of the debate can hardly be overestimated.

2.8. Albert the Great on *Minima naturalia*

2.8.1. Albert the Great on *Minima naturalia*: The Confrontation with Democritus

Albert's doctrine of *minima naturalia* provides important information concerning the state of the debate at Paris around the mid-13th century, although his position is predominantly characterised by idyosincratic elements. In order to reconstruct Albert's position on *minima naturalia*, it is necessary to look together at his *Physics* and at his *De generatione* commentaries. In his paraphrase of the *Physics* (which Albert possibly started to compose already between 1251 and 1252[517]), and specifically of *Physics* I.4, Albert does not discuss *minima naturalia* in an extended way. Rather, he limts himself to state the following:

> Even though in a mathematical continuum it is not possible to reach a minimum, in natural bodies instead a minimum is reached and [also] a maximum, because "the nature of every permanent entity is a given one a [in them] there is a certain and determined ratio of greatness or dimension in smallness and in largeness" [cf. *De anima* II.4, 416a16-17]. Tthis, however, we will prove in the first Book of *De*

[517] Cf. ALBERTUS MAGNUS, *Physica. Libri I-IV*, ed. HOSSFELD, pp. V-VI.

> *generatione et corruptione*, in those [things] which we will say against Democritus and Leucippus[518].

While Albert's distinction between a body *qua* mathematical continuum and *qua* natural body closely echoes Averroes' (and Philoponus') distinction between a body *qua* magnitude and a body *qua* material substance (although it might be discussed whether the two can be exactly superposed), and even though the reference to the passage of *De anima* II.4 in this context is, as mentioned above, something which will become customary in 13th- and 14th-century Latin discussions on *minima naturalia*, the explicit mention of Democritus and Leucippus (rather than that of Anaxagoras) is an innovative element. Such a mention in this context might be motivated by Albert's overall project to provide a systematic presentation of Aristotelian philosophy. In this sense, Albert evidently perceives the issue of *minima naturalia* as being connected to Aristotle's doctrine of the (potential) infinite divisibility of magnitudes and, in this way, also to his criticism against atomism as defended by Leucippus and Democritus. Still, whatever the precise reason of Albert's choice, it is evident that his overall doctrine of *minima naturalia* is perceived as an opportunity to formulate an Aristotelian "alternative" to Democritean atomism. This interpretation will be confirmed in the next chapter by looking at Albert's discussion of *minima sensibilia* in his *De sensu* commentary, where this attempt, if possible, will become even more pronounced (although with some differences).

To start seeing in what way Albert's doctrine of *minima naturalia* can represent an "alternative" to Democritean atomism, it is now time to turn specifically to Albert's *De generatione* commentary (presumably composed between 1251 and 1254[519]), especially given the explicit appeal to it that Albert makes in his commentary on *Physics* I.4. First of all, however, a preliminary textual difficulty is to identify exactly what is the passage to which Albert refers. Paul Hossfeld, the editor of the most rigorous critical edition of Albert's *Physics*, lists three different passages to which the text may refer[520]. Of them,

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[518] ALBERTUS MAGNUS, *Physica. Libri I-IV*, Liber I, tract. II, cap. 13, ed. HOSSFELD, p. 35: "Licet enim in continuo mathematico non sit accipere minimum, tamen in physicis corporibus minimum accipitur et maximum, quia omnium natura constantium terminus quidam est et determinata ratio magnitudinis sive dimensionis in parvitate et magnitudine. Hoc autem probabimus in primo libro *De Generatione et Corruptione*, in his quae dicturi sumus contra Democritum et Leucippum."

[519] Cf. ALBERTUS MAGNUS, *De natura loci. De causis proprietatum elementorum. De generatione et corruptione*, ed. HOSSFELD, p. v.

[520] ALBERTUS MAGNUS, *Physica. Libri I-IV*, Liber I, tract. II, cap. 13, ed. HOSSFELD, p. 35, *ad loc.*

however, the most relevant is certainly the one from Liber I, tract. I, cap. 12, where Albert assesses Democritus' (and Leucippus') position concerning the composition of material bodies.

The first important element to notice is that Albert's discussion in the chapter has recourse to a conception of *minima naturalia* which is strongly reminiscent of the conception of *minima secundum operationem* found in the *Questiones supra libros quatuor Physicorum Aristotelis* falsely ascribed to Bacon:

> Democritus, however, thought that all heterogeneous natural bodies are composed of homogeneous entities, such as the hand by flesh and bones and [things] of this sort; homogeneous entities, truthfully, are composed according to their essence of minimal parts which can have the action of form; indeed, even though it is not possible to reach a *minimum* in the parts of bodies insofar as they are bodies, [such] that something smaller cannot be reached by division, still in a natural body it is possible to achieve a flesh so small [that] if one smaller than it is reached, it will not perform the operation of flesh, and this is a minimal body not insofar as body, but insofar as natural, and this Democritus called atom[521].

The passage is remarkable in many respects. First of all, Albert has recourse to the notion of *minima secundum operationem* in discussing the problem of *minima* in homogeneous material substances. More than that, he explicitly endorses such a theory as being the correct interpretation of Aristotle's *minima naturalia*. Now, the very use of the word *operatio* seems to be indebted to a position akin to that of the *Questiones supra libros quatuor Physicorum Aristotelis* (whereas the expression of *minima secundum actionem*, better, *secundum actionem formae*, seems to show an influence, albeit with a theoretical shift, of the commentary tradition represented by Geoffrey of Aspall). The influence of a position analogous to the one of the *Questiones supra libros quatuor Physicorum Aristotelis* could also be suggested by the fact that the passage makes explicit reference to the Philoponean-Averroistic dichotomy reinterpreting it as a dichotomy between a body *qua* magnitude and a body *qua* material substance endowed with a proper operation in order to frame the theory of *minima secundum operationem*.

[521] ALBERTUS MAGNUS, *De generatione et corruptione*, Liber I, tract. I, cap. 12, ed. HOSSFELD, p. 120, ll. 44-55: "Democritus autem videbat quod omnia naturalia heterogenia componuntur ex similibus sicut manus ex carne et osse et huiusmodi, similia vero componuntur secundum essentiam ex minimis, quae actionem formae habere possunt; licet enim non sit accipere minimum in partibus corporis, secundum quod est corpus, quod non possit accipi minus per divisionem, tamen est in corpore physico accipere ita parvam carnem, qua si minor accipiatur, operationem carnis non perficiet, et hoc est minimum corpus, non in eo quod corpus, sed in eo quod physicum, et hoc vocavit atomum Democritus."

However, what is more remarkable (and bizarre) in the passage is that these *minima secundum operationem* are taken by Albert to be what Democritus identified as atoms (Maier says that this fact has in itself *etwas überraschendes*[522], 'something surprising'). Of course, Albert is fully aware of the fact that Democritean atoms are defined by their indivisibility. Indeed, in his first presentation of Democritus' atoms as the components of material substances a few pages earlier, Albert is clear in pointing out that such atoms are defined as indivisible entities. Nevertheless, he seems to think that, while *minima secundum operationem* are not indivisible (according to matter), they still play a fundamental role as the ultimate (quantitative) consituents of material substances. This position is detailed by Albert in the following passage:

> And because this material entity is composed in the whole body of various material parts, for this reason he [Democritus] said that natural bodies are composed of such entities. And he was not wrong, if he had understood [this claim as] concerning quantitative and natural composition (*de compositione quantitativa et physica*), but he was wrong in this, that he did not see the first essential composition, which is of matter and form; homeomerous flesh, indeed, is composed of matter and form, and so essential composition (*compositio essentialis*), which is constituted by generation, precedes quantitative composition (*compositionem quantitativam*), of which Democritus was talking[523].

Thus, if it is true that, quantitatively speaking, a material substance is composed of *minima secundum operationem*, still it is not (as Democritus would have claimed) by the composition of a certain number of such *minima* that a material substance is formed. Rather, the generation of a material substance depends on the composition of substantial form and matter. Once a substance has been generated, it is possible to discuss its

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[522] MAIER, *Die Vorläufer Galileis im 14. Jahrundert*, *op. cit.*, p. 184: "Dieses Bekenntnis zum Atomismus, das ja immerhin etwas Ueberraschendes hat, ist also *cum grano salis* zu verstehen." Albert's conceptual operation becomes, however, far less surprising when one takes into account also Albert's *De sensu* commentary, where, as I will show in the next chapter, the confrontation between Aristotle's and Democritus' conceptions of sensible qualities (and especially of their "ultimate" composition) becomes a defining feature of Albert's reflection. This consideration, at the same time, allows me to stress that, *contra* Maier, while certainly Albert's Aristotelian "reintepretation" of Democritean atomism does not amount to a renunciation to any of the fundamental commitments of Aristotelian hylomorphism (as Albert goes on to make clear in the passage from the *De generatione* commentary quoted on the next page), it does, however, show that Albert is consciously trying to develop a version of hylomorphism that is not fundamentally opposed to "corpuscularian" assumptions, provided that the "ultimate" components of material substances (and this will be true also for their sensible qualities) remain hylomorphically structured.

[523] ALBERTUS MAGNUS, *De generatione et corruptione*, Liber I, tract. I, cap. 12, ed. HOSSFELD, p. 120, ll. 55-64: "Et quia hoc materiale est ad totum corpus compositum ex pluribus materialibus partibus, ideo dixit ex talibus physica componi corpora. Et non erravit, si de compositione quantitativa et physica intellexerit, sed erravit in hoc, quod non vidit compositionem essentialem primam, quae est ex materia et forma; homyomera enim caro composita est ex materia et forma, et ita compositio essentialis, quae constituitur per generationem, est ante compositionem quantitativam, de qua loquebatur Democritus."

quantitative divisibility in *minima secundum operationem*[524]. Although, therefore, Albert never puts in doubt the fundamental hylomorphic structure of the natural world (what he refers to as the *compositio essentialis*), he seems to come very close to the idea that any given material substance is quantitatively composed by the conjunction of a certain quantity of *minima* that have already undergone the *compositio essentialis* (what he refers to as the *compositio quantitativa*). If this is so, then, it might not be too far-fetched to claim that Albert is here resorting to a "corpuscularian" description of the natural world. This seems indeed to be implied by his use of the notion of the *compositio quantitativa* of material substances out of hylomorphic *minima*. *Minima secundum operationem* play, therefore, the role of the ultimate quantitative components of material substances and, in this specific way, they can be said to be akin to Democritean atoms. How the "corpuscularian" conception presented by Albert could be articulated, however, will be discussed in more detail in the next chapter of the thesis, with reference to Albert's commentary on *De sensu* 6.

2.8.2. Albert the Great on *Minima naturalia*: A Summary

Albert's doctrine of *minima naturalia* is a very important witness of the early discussion of the topic in the Parisian context around the mid-13th century. Nevertheless, the position taken by Albert appears to be largely idyosincratic, and motivated by the fundamental need to provide an interpretation of *minima naturalia* capable of confronting Democritean atomism. This, as said, will become even more prominent (even though in partially different terms) in Albert's *De sensu* commentary, and specifically in his discussion of *minima sensibilia*, as I will show in the next chapter. Albert's attempt, in this sense, as he himself summarises it, seems to be that of providing an explanation of the *compositio quantitativa* of material substances out of *minima* that, nevertheless, not

[524] The same idea is restated by Albert a few lines later, as the closing statement of the chapter in question: "Democritus autem tangit veritatem in hoc, quod dicit compositum physicum a physicis componi principiiis. Sed deviat a veritate in hoc, quod dicit esse minima corporum physicorum atomalia, quia si ulterius dividantur, non habent actionem physicam, cum ipsa sint minima operantia physice, quae sunt materia et forma simplicia quidem et minima quantitate, sed maxima virtute constituendi generatum physicum" (ALBERTUS MAGNUS, *De generatione et corruptione*, Liber I, tract. I, cap. 12, ed. HOSSFELD, p. 120, ll. 72-80).

only are further divisible, but that preserve the *compositio essentialis* of matter and substantial form.

How are these *minima* to be understood? In his *Physics* commentary Albert does not say it, limiting himself to restate the Philoponean-Averroistic dichotomy between a body *qua* continuous magnitude and a body *qua* hylomorphically structured material substance, and announcing that he will discuss the issue further in his commentary on *De generatione* Book I. This is easy to understand once it is recalled that Albert takes the whole issue of *minima naturalia* to be an issue that is to be analysed in connection with Democritean atomism, and that, as detailed in the previous chapter, *De generatione* I.2 and I.8 especially represent two particularly prominent places where Aristotle confronts Democritean atomism.

In his commentary on *De generatione* Book I, therefore, it is possible to find a full presentation of Albert's doctrine of *minima naturalia*. His position, which is not too distant from the one of the *Questiones supra libros quatuor Physicorum Aristotelis*, is based on the idea that the substantial forms of homogeneous material substances, below a certain threshold of smallness of the matter they inform, lose the power to act. Albert seems, therefore, to subscribe to a doctrine of *minima naturalia secundum operationem*. These minima, according to Albert, represent the ultimate quantitative components of homogeneous material substances, and it is precisely in this sense that they can be considered akin to Democritean atoms. Still, they are fundamentally different from it not only in the fact that they are further divisible, but especially in that they are hylomorphic compounds of matter and substantial forms. In this sense, remarkably, Albert hold forth to Aristotelian hylomorphim as the only doctrine capable of explaining the metaphysical nature of homogeneous material substances, while accepting a "corpuscularian" model concerning their production and their mereological structure. It is exactly this model that will be further detailed (and partially modified) in Albert's later paraphrase of *De sensu* 6, 445b3-446a20.

2.9. The Medieval Latin Debate on *Minima naturalia* in the Central Decades of the Second Half of the 13th Century

The debate on *minima naturalia* changed significantly in the late 1260s, thanks to the innovations taking place predominantly at athe Parisian Faculty of Arts and at that of Theology. Indeed, on the one hand, Aquinas' exposition of the *Physics* inaugurated a new and more rigorous understanding of Averroes' approach to *minima naturalia*. On the other hand, even those contemporary masters at the Faculty of Arts who proposed alternative accounts challenged those of previous (predominantly Oxford) commentators and developed new understandings of *minima naturalia*. It is hard to speculate as to what were the reasons for this change of perspective. One element which, as will become apparent in the following sections, seems to have played a major role is the availability of new translations of Aristotle's *libri naturales*, especially the *Physics*, the *De generatione et corruptione* and the *De sensu et sensato*. Nevertheless, it seems at the same time that the general level of theoretical sophistication of the academic debate, both at the Parisian Faculty of Arst and at that of Theology, was increasing at a very fast pace.

2.9.1. Thomas Aquinas: The Triumph of *Minima secundum formam*

For now, let us focus on Thomas Aquinas' role in developing the discussion on *minima naturalia*. Aquinas' solution to the issue of *minima naturalia*, in his commentary on *Physics* I.4, is contained in the following passage:

> If indeed a continuum is infinitely divisible, [and] moreover flesh is a certain continuum; it appears that it is infinitely divisible. Therefore a part of flesh transcends any limited smallness according to an infinite division. But it must be said that even though a body, considered mathematically, is infinitely divisible, still a body [insofar as it is] natural is not infinitely divisible. Indeed in a mathematical body nothing is considered apart from quantity, in which nothing is found that is incompatible with an infinite division; but in a natural body it is considered the natural form, which requires a determined quantity such as also other accidents. Hence it cannot be found a quantity in the species of flesh if not determined within certain limits[525].

[525] THOMAS DE AQUINO, *In octo libros Physicorum Aristotelis expositio*, Liber I, lectio IX, n. 66, ed. MAGGIOLO, p. 36: "Si enim continuum in infinitum divisibile est, caro autem continuum quoddam est; videtur quod sit in infinitum divisibilis. Omnem igitur parvitatem determinatam transcendet pars carnis secundum divisionem infinitam. Sed dicendum quod licet corpus, mathematice acceptum, sit divisibile in

Now, the passage presents many important elements that need to be carefully discussed. First of all, Aquinas seems to be taking the Philoponean-Averroistic dichotomy between bodies considered *qua* continuous magnitudes and *qua* hylomorphically structured material substances from Albert's paraphrase of the *Physics*. Indeed, as seen above, Albert uses the expression *continuum mathematicum*, an expression which seems to have influenced here Aquinas when he speaks of a body *mathematice acceptum* and, a bit later, directly of a *corpus mathematicum* (an expression, by the way, also used in a partially different context by Albert, as remarked in the previous chapter)[526].

If, on the strength of this evidence, it seems possible to say that Aquinas is here relying on Albert's paraphrase, it is all the more important to notice that, nevertheless, he does not follow his master in explaining why material substances, insofar as they are endowed with a substantial form, are not infinitely divisible.

Indeed, Aquinas' doctrine of *minima naturalia* relies on a general and overarching principle of Aristotelian substance metaphysics, according to which a substantial form determines by itself the minimal quantity of matter in which it can exist. This idea, probably depending on Aquinas' intention to provide a systematic understanding of *minima naturalia* in the framework of the general principles of Aristotle's natural

infinitum, corpus tamen naturale non est divisibile in infinitum. In corpore enim mathematico non consideratur nisi quantitas, in qua nihil invenitur divisioni in infinitum repugnans; sed in corpore naturali consideratur forma naturalis, quae requirit determinatam quantitatem sicut et alia accidentia. Unde non potest inveniri quantitas in specie carnis nisi infra aliquos terminus determinata."

[526] Edith Sylla recenlty remarked that the notion of *corpus mathematicum* (an oxymoron in Aristotelian terms) is of great theoretical interest and, as such, it would be important to trace its occurrences through the Latin Middle Ages and, of course, especially in commentaries on the *Physics* and the other Aristotelian *libri naturales* (cf. E.D. SYLLA, *Averroes and Fourteenth-Century Theories of Alteration*. Minima naturalia *and the Distinction between Mathematics and Physics*, in P.J.J.M. BAKKER (ed.), *Averroes' Natural Philosophy and its Reception in the Latin West (Ancient and Medieval Philosophy – Series 1, 50)*, Leuven, Leuven University Press, 2015, pp. 141-192). While Sylla found the notion in the *In Physicam Aristotelis* attributed to Richard Rufus of Cornwall, here I add to the list the abovementioned occurrence in Thomas Aquinas, as well as the one already noted in the previous chapter in connection with Albert. Moreover, as I will show in Chapter 4, the notion features prominently also in Jandun's discussion of *minima sensibilia* (especially in q. 29 of his *De sensu* commentary). While I cannot deal with the issue here, it seems to me that all the occurrences of the notion of *corpus mathematicum* in the Medieval Latin debate on *minima* should not be taken as identifying, positively, a certain class of entities, but rather as indicating the "limit" situation of a material substance deprived, due to progressive division, either of its substantial form (Aquinas seems to be using the expression with this meaning in the passage just quoted in the main text), or of the accidental forms of its sensible qualities (as I will show in Chapter 4, Jandun uses the expression in this sense in his *De sensu* commentary). For what concerns the interpretation of the notion of *corpus mathematicum* employed by Aquinas in this same passage, see also TRIFOGLI, "Duns Scotus and the Medieval Debate about the Continuum", *op. cit.*, p. 252: "He [i.e., Aquinas] makes clear that a mathematical body is not something over and above a natural body. A mathematical body is a natural body taken mathematically, that is, a natural body in which only its quantity is considered, whereas a natural body is the same body in which also its form is considered."

philosophy, is extremely interesting and, what is more, it probably constitutes the most faithful interpretation of Averroes' conception of *minima naturalia* in the Latin West (although, as I have shown above, Averroes' doctrine had already been accepted, in its most general form, by previous commentators, such as Adam of Buckfield).

Indeed, Aquinas (just like Averroes) does not even refer to the corrupting action of the containing medium in explaining why there are *minima naturalia* "in being", so to speak, and not merely in operation. His position is that the existence of *minima naturalia* "in being" in material substances depends on a fully intrinsic cause, one which does not require a reference to the medium which surrounds the substance itself. To put it in other words, according to Aquinas, there would be *minima naturalia* "in being" in material substances even if, by a thought experiment, we were to conceive them as not being acted upon by the containing medium. This is the reason why Aquinas' understanding of *minima naturalia*, which I see fit to label as that of *minima secundum formam*, as mentioned above, is to be considered a genuine innovation over the positions of previous Latin commentators (while constituting an important moment of the reception of Averroes' conception of *minima naturalia*), one which, as the next section will make clear, would have had an important posterity in the Medieval Latin debate on *minima naturalia* at the Parisian Faculty of Arts in the early decades of the second half of the 13th century.

2.9.2. Pseudo-Siger of Brabant: Defending *Minima secundum formam* against Alternative Doctrines of *Minima naturalia*

A few years after Aquinas had developed his interpretation of *minima naturalia* as *minima secundum formam*, some Parisian *magistri artium* not only adopted it, but even defended it against the "deviant" interpretations of *minima naturalia* of the earlier commentary tradition, especially against the idea of a *minimum secundum actionem* and *secundum operationem* on the one hand, but also against what I have called the doctrine of *minima secundum corruptionem* on the other hand. A central text concerning this development is the commentary on the *Physics* (Books I-IV and VIII) contained in ms. München, Staatsbibliothek, Clm 9559, ff. 18ra-39vb and 40ra-44ra, dating between 1271 and 1277 and attributed by its editor, Philippe Delhaye, to Siger of Brabant (ca. 1240-ca.

1284), one of the most controversial *magistri artium* teaching at Paris during the second half of the 13th century, and almost certainly spurious (I will therefore refer to the author of the commentary as the 'Pseudo-Siger'). A much more likely attribution seems to be that to Peter of Auvergne (ca. 1240/50-1304), one of the longest serving *magistri artium* at the Faculty of Arts in Paris during the second half of the 13th century (from the 1270s to the 1290s) and appointed *doctor theologiae* at Paris in 1296 and bishop of Clermond by Boniface VIII in 1302[527]. The commentary devotes a *quaestio*, q. 26 on Book I, to the

[527] The edition is (PSEUDO-)SIGER DE BRABANT, *Questions sur la* Physique *d'Aristote (Les Philosophes Belges 15)*, ed. P. DELHAYE, Louvain, Institut supérieur de Philosophie, 1941. The first important critiques to the attribution of the commentary to Siger after its publication under his name, based on doctrinal reasons, are those by Armand Maurer: cf. esp. A.A. MAURER, "*Esse* and *Essentia* in the Metaphysics of Siger of Brabant", *Mediaeval Studies* 8, 1946, pp. 68-86, esp. pp. 68-77 and p. 85, n. 62, and ID., "The State of Historical Research in Siger of Brabant", *Speculum* 31 (1), 1956, pp. 49-56. The first to suggest, again on doctrinal grounds, a possible attribution to Peter of Auvergne has been W. DUNPHY, "The Similarity between Certain Questions of Peter of Auvergne's *Commentary on the* Metaphysics and the Anonymous *Commentary on the* Physics Attributed to Siger of Brabant", *Mediaeval Studies* 15, 1953, pp. 159-168. In 1961 Charles Ermatinger discovered a new witness of the same commentary, namely, ms. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° 349 (14th century), ff. 1ra-68vb, including a full commentary on *Physics* I-VIII, together with a different commentary (probably two different *reportationes* of the same course, to be attributed not directly to Siger but to someone closely related to him) in the same Erfurt manuscript (ff. 75ra-117rb) and in the ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 6758, ff. 1ra-43vb (cf. C.J. ERMATINGER, *Additional Questions on Aristotle's* Physics*, by Siger of Brabant or His School*, in P. SESTO (ed.), *Didascaliae, Studies in Honor of Anselm M. Albareda*, New York, NY, B.M. Rosenthal, 1961, pp. 97-120, and, more recently, S. DONATI, *Commenti parigini alla* Fisica *degli anni 1270-1300 ca*., in A. SPEER (ed.), *Die Bibliotheca Amploniana (Miscellanea Mediaevalia 23)*, Berlin-New York, NY, de Gruyter, 1995, pp. 136-256, esp. pp. 143 ff.). The prevailing position today is that the attribution to Peter is likely for the portion of the commentary which is reported in both witnesses (the München manuscript published by Delhaye and the ff. 1ra-68vb of the Erfurt manuscript), namely Book I, q. 23-Book IV, q. 30 of the München manuscript, and Book I, q.18, 22 – Book IV, q. 30 of the Erfurt manuscript (cf. C. FLÜELER, L. LANZA, M. TOSTE (eds.), *Peter of Auvergne. University Master of the 13th Century (Scrinium Friburgense 26)*, Berlin, de Grutyer, 2015, pp. 437-438. Without having to take position on the issue of attribution here, it is worth remarking that the position on *minima naturalia* presented in this commentary is largely compatible, as it will be shown below, with the one that can be ascribed to Peter of Auvergne based on works whose authenticity is undisputed. For a recent summary of the debate, see D. CALMA, E. COCCIA, "Un commentaire inédit de Siger de Brabant sur la *Physique* d'Aristote (ms. Paris, BnF, Lat. 16297)", *Archives d'histoire doctrinale et littéraire du Moyen âge* 73 (1), 2006, pp. 283-350, esp. pp. 284-288. Note that a different commentary on the *Physics* (the last chapter of Book I and Book II) whose attribution to Siger of Brabant seems likely, has been discovered by Anneliese Maier in 1946 in the ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Borgh. 114, ff. 15ra-18va (cf. A. MAIER, "Nouvelles Questions de Siger de Brabant sur la *Physique* d'Aristote", *Revue philosophique de Louvain* 44, 1946, pp. 497-513). The text has been edited by Albert Zimmermann in his doctoral thesis and then printed as A. ZIMMERMANN, *Les* Quaestiones in Physicam *de Siger de Brabant*, in SIGER DE BRABANT, *Écrits de logique, de morale et de physique (Philosophes Médiévaux 14)*, éd. critique par B. BAZAN, A. ZIMMERMANN, Louvain-Paris, Publications universitaires-Béatrice Nauwelaerts, 1974, pp. 143-184. Since, however, the commentary does not deal with *Physics* I.4, it has not been considered in the present chapter. Still another *Physics* commentary which has been attributed to Siger, or to someone closely related to him, has been identified in the ms. Paris, Bibliothèque Nationale de France, Lat. 16297, ff. 117ra-126 (for Books I-IV) and ff. 127-130vb (for Book VIII), and it has been edited by Zimmermann as A. ZIMMERMANN, *Ein Kommentar zur* Physik *des Aristoteles. Aus der Pariser Artistenfakultät um 1273 (Quellen und Studien zur Geschichte der Philosophie 11)*, Berlin, de Gruyter, 1968. Since this commentary as well does not deal with the issue of *minima naturalia*, it has also been excluded from consideration in this chapter. The same

issue of *Utrum in naturalibus sit ponere minimum*. After presenting the arguments against the idea of *minima* in homogenenous material substances (which seem to be partly derived from the tradition of the *Physics* commentary attributed to Richard Rufus and of Roger Bacon's one), and after focusing mostly on the argument for their existence presented by Aristotle in *Physics* I.4 (187b13-21), the author of the commentary notes the following:

> Some said that the *minimum* is limited according to action (*secundum actionem*) and it is such with the last [that] can operate, so that if it were divided it could not act anymore, and such is limited: however, a *minimum* according to virtue (*secundum virtutem*) is not limited, because it is such, according to those, [that] of which it cannot be found a smaller one, and it is not limited, and it cannot be found. And they took this from the *De sensu et sensato*, where Aristotle says that the sensible is double: according to action (*secundum actionem*) and according to virtue (*secundum virtutem*), the sensible according to action, however, is limited, the sensible according to virtue is not, such as he says[528].

It is difficult not to see in this passage a reference to authors who expounded the same position on *minima naturalia* adopted by Geoffrey of Aspall, that is, a position based on the distinction between *minima secundum virtutem* and *minima secundum actionem* relying on the text of *De sensu* 6 (but even more directly, as the rest of the discussion will make clear, to any notion of *minima secundum operationem* relying on the same text). However, interestingly, the commentator goes on to challenge such positions on the basis of the very same authority of *De sensu* 6, that is, claiming that the distinction between *minima secundum virtutem* and *minima secundum actionem* proposed by these authors is not warranted by the Aristotelian text[529]. Indeed, the commentator notes,

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manuscript also preserves a separate *Physics* commentary, at the ff. 70va-73va (Books I-II) and ff. 76ra-76vb (Books III-IV), which has been edited in CALMA, COCCIA, "Un commentaire inédit de Siger de Brabant sur la *Physique* d'Aristote (ms. Paris, BnF, Lat. 16297)", *op. cit*. The text, copied in a synthesised form by Godfrey of Fontaines from a larger *Physics* commentary, might be attributed to Siger, according to the editors, based on its doctrinal content (cf. *ibid*., pp. 316-317). Yet, whatever the truth of the matter concerning the attribution, not even this text deals with *minima naturalia*, and it has been therefore excluded from the present chapter.

[528] (PSEUDO-)SIGER DE BRABANT, *Questions sur la* Physique d'Aristote, Liber I, q. 26, ed. DELHAYE, p. 57: "Dixerunt quidam quod minimum secundum actionem terminatum est et est tale cum ultimo potest in operationem ita quod si divideretur non potest in actionem, et tale terminatum est; minimum autem secundum virtutem non est terminatum, quia tale est, secundum eos, quo minus non potest reperiri, et non est terminatum, nec potest reperiri. Et assumpserunt hoc a libro *De sensu et sensato* ubi dicit Aristoteles quod sensibile duplex est: secundum actionem et secundum virtutem, sensibile autem secundum actionem est terminatum, sensibile secundum virtutem, non, ut ipse dicit."

[529] To be precise, the Pseudo-Siger also adopts a different argument, taken from Averroes' *Long Commentary* on the *Metaphysics*, and especially on Θ.3 (although he wrongly claims that it is taken from the *Long Commentary* on *Metaphysics* Λ), an argument addressed by Averroes against the occasionalism

sensible qualities *secundum virtutem* should be understood as those which are present (as parts) in a whole existing in act. For instance, the whiteness of a small portion of a whole is a whiteness *secundum virtutem* insofar as it is part of the whiteness of the wall considered as a whole existing in act. On the contrary, sensible qualities *secundum actionem* are those that have a separate existence in act. For instance, the whiteness of a wall existing in act is a whiteness *secundum actionem*[530].

After discussing these views, the author of the commentary goes on to present another alternative solution that, evidently, had already become a legitimate position concerning *minima naturalia* in the debate at the Parisian Faculty of Arts in the early decades of the second half of the 13th century. This position is the one that I have labelled of *minima secundum corruptionem*, i.e., the idea that the substantial forms of extremely small portions of material substances existing on their own are corrupted due to the action of the containing medium. Interestingly, this is another position that has a basis in the text of *De sensu* 6, specifically at 446a7-10, as I will aboundantly make clear in the next chapters. There, indeed, Aristotle explicitly claims that extremely small portions of material substances, together with their sensible qualities, are resolved in the containing

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of Ash'arite theology and based on the idea that the power to perform their proper operation is what distinguishes different essences. This argument would have had a great significance in John of Jandun's discussion of *minima sensibilia* (and in the on of the commentators closest to him), as it will be shown in Chapter 4, therefore I postpone its full presentation to that chapter. Nevertheless, it is interesting to remark how the Pseudo-Siger considers it an argument against the very idea that a substantial form can exist without the power to perform its proper operation (using it in the same vein as the one in which it will be later used in the debate on *minima sensibilia*): "Sed illud non est verum, nec secundum intentionem Philosophi. Falsum quidem est, quia unumquodque naturalium habet aliquam propriam operationem, in quam, cum potest, dicitur <singulare>, et, cum non potest, non dicitur nisi aequivoce, ut dicitur quarto *Meteororum*. Si igitur aliquid naturale est ista (*pro*: ita) parvum quod secundum actionem non est naturale, quia operationem suam naturalem non habet, tunc non dicetur ens naturale, nisi aequivoce, vel et sic, tunc habet suam operationem. Et in idem redit dictum Commentatoris, *Super Duodecimum Metaphysicorum*, quod qui negat entibus suas operationes, negat eis formas substantiales" ((PSEUDO-)SIGER DE BRABANT, *Questions sur la* Physique d'Aristote, Liber I, q. 26, ed. DELHAYE, p. 57). The application of the argument in the context of discussions on Aristotelian *minima* (significantly, both *minima naturalia* and *minima sensibilia*, to remark, once again, how connected the two issues were taken to be by Medieval Latin commentators) in the Parisian debate of the late 13th and early 14th century is an interesting instance of the "creative" use made of Averroes by commentators working in this context. For an introduction to Averroes' own use of the argument, see B.S. KOGAN, *Averroes and the Metaphysics of Causation*, Albany, NY, State University of New York Press, 1985, pp. 89-91. For its influence in the Latin world of the 13th and the 14th century, see the references provided below in Chapter 4.

[530] (PSEUDO-)SIGER DE BRABANT, *Questions sur la* Physique d'Aristote, Liber I, q. 26, ed. DELHAYE, p. 57: "Nec est haec intentio Aristotelis: sensibile enim actione vocat partem separatam, virtute vero partem in toto." It is interesting to remark that, around the same time of the composition of this commentary William of Moerbeke's revision of the *translatio vetus* of the *De sensu*, where the terminology of *sensibile virtute* and *actione* is abandoned, had just started to circulate at Paris.

medium upon separation from the whole to which they belong, such as a drop of a flavorous liquid poured into the sea.

The line of reasoning adopted by the author of the commentary against this position is significantly based on the idea that the medium cannot act as a corrupting agent insofar as it constitutes an instrumental cause through which material substances are infused with their being, and it cannot therefore at the same time act as a corrupting agent of these same substances. Evidently, the author of the commentary is here relying on a "vertical" model of causality according to which celestial intelligences contribute to the generation of material substances in the sublunary world and, in this sense, the containing medium represents an intermediate "layer" of causality between the celestial intelligences and sublunary material substances themselves. It would lie completely outside of the scope of the present chapter trying to identify the specific model of causality supported by the commentator, even more so given the fact that the passage in which it is presented is extremely short (only a full analysis of the commentary might reveal some more elements in this respect). Nevertheless, it is certainly important to quote the relevant passage in full, even more so considering the fact that this line of reasoning is not adopted by any of the other commentators studied in the present thesis, neither in the debate on *minima naturalia* nor in the one on *minima sensibilia*:

> Others claimed that the *minimum* in natural entities is not determined according to the nature of the things, but it is determined according to the nature of the containing [medium], so that a minimal fire is called that of which a smaller one cannot be preserved through the containing [medium], although in itself there could be a smaller one: hence they said that if the containing [medium] were removed, there would be no reason to posit a *minimum* in natural entities. But [this position] does not stand, because any natural entity whatsoever has a natural order to the containing [medium] (*naturalem habet ordinem ad continens*): indeed the containing [medium] is in some way a cause, because the power of the superior cause is received in the effect through the containing [medium], hence it is a preserving agent in being through this power. If, therefore, the quantity of a certain [material substance] is determined by the containing [medium], it is evident that it will be determined by its nature and therefore those that claim so admit and deny the same [claim]; for this reason, etc.[531].

[531] (PSEUDO-)SIGER DE BRABANT, *Questions sur la* Physique *d'Aristote*, Liber I, q. 26, ed. DELHAYE, pp. 57-58: "Alii dixerunt quod minimum in naturalibus non est terminatum quantum est de natura rerum, sed determinatur ex natura continentis, ita quod minimus ignis dicatur quo minus non potest salvari per continens, posset tamen de se esse minor : unde dixerunt quod, si removeretur continens, non esset in naturalibus ponere minimum. Sed non valet, quia unumquodque naturalium naturalem habet ordinem ad continens: continens enim est aliquo modo causa, quia virtus causae superioris recipitur in effectu mediante continente, unde conservans est in esse per istam virtutem. Si igitur ex continente determinata est quantitas

The Pseudo-Siger, then, goes on to explain what is the correct interpretation of *minima* that the text of *De sensu* 6 supports, and, in this context, he also explains what is the precise role of the containing medium in the doctrine of *minima naturalia* according to this text:

> And therefore it must be said, according to Aristotle at the end of the *De sensu et sensato*, that in natural entities there is a separate *minimum* which cannot be preserved in its nature and by itself, but in the whole there is no *minimum* of which there is nothing smaller. The proof of the first [conclusion] is because, if something is divided in some parts and any part in other [parts], one will reach some part so small which, reasonably, it will be resolved in the containing [medium], such as Aristotle says in the *De sensu et sensato*. And the reason of this is because nature does not only give being, but also the power to be preserved in being and of contanining. And moreover in continuous [bodies], if in the greater one there is a greater power, also in the smaller one there will be a minor one. If therefore nature gives the power to be preserved in being and this [power] is finite, because there is a certain minimum of that power, and in a greater body there is a greater power, and in a smaller one a smaller [power]; because it will be reached something so small that, if it is divided, it will not remain anymore [of the same nature][532].

The argument of the Pseudo-Siger is clear. According to a distinction made prominently in *De sensu* 6, while it is true that there is no *minimum* in homogeneous material susbtances merely considering the parts existing potentially in a given whole (secundum virtutem), there is a *minimum* once such parts are "physically" separated from the whole to which they belong, so as to come to exist in act on their own (secundum actionem). This *minimum*, however, is a *minimum* that is metaphysically determined by the preserving power of the substantial form itself. The Pseudo-Siger, thus, ultimately adopts a doctrine of *minima secundum formam* that, although it is formulated in slightly different terms from the way Aquinas formulates it in his *Physics* commentary, uses the exact

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alicuius, manifestum est quod ex natura sua est determinata et ideo qui sic dicunt concedunt et negant idem; quare etc."

[532] (PSEUDO-)SIGER DE BRABANT, *Questions sur la* Physique *d'Aristote*, Liber I, q. 26, ed. DELHAYE, p. 58: "Et ideo dicendum secundum Aristotelem fine *Libri de sensu et sensato* quod in rebus naturalibus est dare minimum separatum quod potest salvari in natura sua per se, sed in toto non est dare aliquod minimum quo minus non contingit dare. Declaratio primi est, quia, si dividatur aliquid in aliquas partes et quaelibet pars in alias, erit devenire ad aliquam partem ita parvam quae rationaliter resolvatur in continens, ut dicit Aristoteles *Libro de sensu et sensato*. Et huius ratio est quia natura non tantum dat esse sed virtutem conservandi in esse et continendi. Et iterum in continuis, si in maiori est maior virtus, et in minori erit minor. Si igitur natura dat virtutem conservandi in esse et ipsa finita est, quare est aliquod minimum illius virtutis, et in maiori corpore est maior virtus, et in minori, minor; quare erit devenire ad aliquid ita parvum quod, si dividatur, non amplius manebit."

same language that Aquinas will adopt in his *De sensu* commentary, as I will show in the next chapter.

Significantly, for the Pseudo-Siger (as for Aquinas in his *De sensu* commentary) the containing medium does not play any causal role in the corruption of portions of a homogeneous material substance smaller than the *minimum naturale*. Nevertheless, the medium has a role to play insofar as, upon corruption, such portions of a material substance immediately acquire the substantial form of the medium itself and the accidental forms of its sensible qualities. It is this, so the Pseudo-Siger claims, the correct interpretation of Aristotle's text in *De sensu* 6, 445b3-446a20, an interpretation that does not come far even from the one that Peter of Auvergne will provide in his *De sensu* commentary (thus reinforcing the hypothesis of a direct attribution of this commentary to him[533]).

Be that as it may for what concerns its attribution, the commentary at hand, through its discussion of *minima naturalia*, constitutes a powerful tribute to the relevance that the text of *De sensu* 6, 445b3-446a20 had acquired in the debate on *minima naturalia* at the Parisian Faculty of Arts in the early decades of the second half of the 13th century.

[533] According to the doctrine of *minima sensibilia* put forth by Peter of Auvergne in his *De sensu* commentary, indeed, that I will detail in the next chapter, it appears that Peter's view is that the minimal quantity of matter (the *minimum naturale*) in which the substantial forms of homogeneous material substances can resist to the corrupting action of the containing medium is the same in which they can inform matter, so that, if there were no corrupting action of the containing medium, the substantial forms of homogeneous material substances would be corrupted in portions of matter smaller than their *minimum naturale* due to a fully intrinsic reason. Peter of Auvergne's adherence to the doctrine of *minima secundum formam*, in any case, appears in a particularly strong way in his *Quodlibeta*, and especially in the first *quaestio* of his first *Quodlibet*, Peter discusses the problem of whether God's power is infinite in strength. In discussing the arguments in support of the view that God's power is infinite *simpliciter* (the view he endorses), Peter notes that the power of an agent that is the principle of an infinite action (as creation *ex nihilo* is) must be infinite. Equally, the power of an agent which is an infinite mover (since he is the ultimate cause of every other mover) must be infinite. Peter, nevertheless, considers important to notice that the infinity of God's power with respect to movement does not mean, among other things, that such a power can produce a movement of infinite speed. Now, Peter notices, the speed of any natural movement is determinate (finite) both *qua* movement and *qua* natural. *Qua* movement, because movement is in time, and infinite speed is not. *Qua* natural, because: "Ex hoc autem quod naturalis, omnia enim naturalia ad maius et minus naturaliter terminate sunt, sicut minima terra naturaliter terminata est. Similiter autem et minimus ignis. Et similiter se habet in unoquoque naturalium, sicut dicit Philosophus I *Physicorum* [cf. *Physics* I.4, 187b13-21]. Et iterum, libro *De sensu* [cf. *De sensu* 6, 446a7-10] dicit quod divisio passionum et formarum naturalium in partes quae natae sunt manere separate non procedit in infinitum, sed necessario terminatur. Quia et motus naturales secundum velocitatem terminati sunt naturaliter et ad minus et maius" (PETRUS DE ALVERNIA, *Quodlibet* I, q. 1, in C. SCHABEL, *The* Quodlibeta *of Peter of Auvergne*, in ID. (ed.), *Theological* Quodlibeta *in the Middle Ages. The Fourteenth Century (Brill's Companions to the Christian Tradition 7)*, Leiden-Boston, MA, Brill, 2007, pp. 81-130, Appendix II, pp. 124-130, p. 128, ll. 5-13).

In many ways, it might be claimed that such a debate had become, in that intellectual context, a debate on the correct interpretation of *De sensu* 6, 445b3-446a20.

2.9.3. Boethius of Dacia: The Criticism of *Minima secundum formam* and of Alternative Doctrines of "Intrinsic" *Minima naturalia*

The view adopted by the Pseudo-Siger, nevertheless, and the doctrine of *minima secundum formam* more generally, would have soon come under fire at the Parisian Faculty of Arts. This is already evident in a *Physics* commentary originating from the 1270s Faculty of Arts at Paris, namely, the one attributed to Boethius of Dacia, one of the most important Master of Arts active at Paris during the 1270s, and edited by Geza Sajó[534].

Before laying out his own positive view, however, in the determination of q. 19 of his commentary on *Physics* I, *Utrum contingit ponere corpus homogeneum minimum, ut carnem minimam*, Boethius deems worthy to refute, analogously to the Pseudo-Siger, the theory of *minima secundum actionem* (and also *secundum operationem*), therefore contributing to show the existence of a collective reaction to such views in the 1270s Parisian Faculty of Arts[535].

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[534] Cf. BOETHIUS DE DACIA, *Quaestiones super libros Physicorum (Boethii Dacii opera, Vol. V Pars II)*, ed. G. SAJÓ, København, GEC GAD, 1974.

[535] BOETHIUS DE DACIA, *Quaestiones super libros Physicorum*, Liber I, q. 19, ed. SAJÓ, p. 167: "Ad istam quaestionem aliquando dicitur quod non contingit ponere ignem minimum in esse, sed quolibet igne posito contingit ponere minorem; sed ignem minimum in actione contingit accipere, et est huiusmodi ignis quod si minor accipiatur, non habebit actionem ignis. – Sed istud non videtur: Primo ex 4° *Meteororum* ante illam partem *terra pura* <*non fit lapis*> dicente: cuilibet corpori naturali debetur aliqua actio in quam si non potest, non est naturale nisi aequivoce, ut patet de oculo: qui non potest in operationem suam non est oculus. Sic igitur de igne: si non contingit sumere ignem minimum in esse, nec in actione. Praeterea, accipiatur ignis quem dicis minimum in actione ita quod ignis non possit in operationem ignis, iste non est minimus. Dividatur ergo iste, divisus non potest in operationem suam. Sit tunc inferius in mundo iste ignis, aut quiescit aut movetur ad locum. Non potest quiescere, quia non violenter, quia non est aliquid quod facit violenter; nec naturaliter, quia illic quiescit naturaliter ad quod movetur naturaliter, sed non movetur ignis ad inferius mundi naturaliter, ergo non quiescit ibi; movetur ergo ignis. Ergo secundum <hoc> nec erit ignis minimus nec in esse nec in actione." It is noteworthy to remark, nevertheless, that the argumentative strategy followed by Boethius is entirely different from the one adopted by the Pseudo-Siger. Not only, indeed, Boethius never refers to the text of the *De sensu*, but he never uses the argument taken from Averroes' *Long Commentary* on the *Metaphysics* adopted by the Pseudo-Siger (although he does refer to an auctoritas from *Meteorologica* Book IV that would play a role in the debate concerning the relation between the essence and the proper operation of sensible qualities in the discussion of *minima sensibilia* at the Parisian Faculty of Arts around the turn of the century, as I will show in Chapter 4. This said, his main argument against *minima secundum actionem* and, especially, secundum operationem is entirely original, and it is based on the idea that even though a portion of a homogeneous material substance were so small as to be unable to perform any operation whatsoever on the outside environment, still it would move

Significantly, however, after this discussion, Boethius' *determinatio* starts to move away from the Pseudo-Siger's one. First of all, indeed, Boethius explicitly attacks a conception of *minima naturalia* which seems to be identifiable with that of *minima secundum formam*:

> Because of this some said in a different way that it happens to reach a minimal fire not only in action, but [also] in being, because if is divided, it will not be fire, but the nature of fire will be corrupted. And the argument of those [who claim this] was because the form of fire determines by itself the quantity in the smaller of which it cannot be. – But against this [I argue] in this way: every corruption happens by a contrary, [as it is said] in the *De morte et vita* [cf. *De longitudine et brevitate vitae*, 3, 465b7-9]; but dividing, or division, is not a contrary of fire, therefore fire is not corrupted by this, that the same is divided. Moreover, the corruption of a simple body is impossible in the absence of the generation of another simple body: if, indeed, fire is corrupted and something else is not generated, pure matter (*materia nuda*) will remin, which is against Aristotle in Book I of *De generatione* [cf. *De generatione* I.5, 320b16-17 and 321a6-7]. Since, therefore, dividing fire cannot generate water or earth in that it divides fire, therefore dividing fire does not corrupt fire[536].

Boethius' arguments against the view of *minima secundum formam* are two strictly connected ones. They are based on a close analysis of what the *corruptio* of a material substance is, in Aristotelian natural philosophy, and of what its necessary conditions are. The first argument presented by Boethius is based on the Aristotelian principle that the corruption of a material substance, according to a *dictum* of the *De longitudine et brevitate vitae* (one that also features in Roger Bacon's discussion of *minima sensibilia*, as I will show in the next chapter), can only take place due to the action of an agent which is contrary to the substance being corrupted[537]. Yet, division by itself is not contrary to

towards its natural place and, as such, it would still be able to act on the outside environment (recall that moving to its natural place is one of the two kinds of operation of substances distinguished by Aspall in his discussion of *minima secundum actionem*).

[536] BOETHIUS DE DACIA, *Quaestiones super libros Physicorum*, Liber I, q. 19, ed. SAJÓ, pp. 167-168: "Propter hoc aliter dixerunt quod contingit accipere ignem minimum non solum in actione, sed in esse, quia si dividatur, non est ignis, sed corrumpitur natura ignis. Et ratio eorum fuit, quia forma ignis quantitatem sibi determinat in qua minor esse non potest. – Sed contra hoc sic: omnis corruptio a contrario est, in libro *De morte et vita*; sed dividens sive divisio non contrariatur igni, ergo ignis non corrumpitur per hoc quod ipse dividitur. Item, impossibile est corruptio corporis simplicis absque generatione alterius corporis simplicis: si enim corrumpitur ignis et non generatur aliud, remanet materia nuda quod esta contra Aristotelem primo *De generatione*. Cum igitur dividens ignem non potest aquam vel terram generare in eo quod dividit ignem, ergo dividens ignem non corrumpit ignem."

[537] Note, however, that the claim that division alone can never bring about corruption also features prominently in one of the Aristotelian texts referred to in the previous chapter of the thesis, namely, *De generatione* I.2, 317a17-23.

any material substance, therefore it cannot determine the corruption of any material substance.

Secondly, Boethius remarks that corruption, intended as substantial change, according to Aristotle's analysis in *De generatione* Book I, can only take place if from the corrupted substance a new one is generated, which shares with the corrupted one the substratum, but not the substantial form. Again, Boethius notes, in the case of the division of a material substance, what the position of *minima secundum formam* claims is that corruption occurs without the generation of a new substance (be that a simple body or not) and, therefore, it is impossible that, by mere division of a material substance, the substance is corrupted.

It would be difficult to exaggerate the importance of Boethius' arguments against the doctrine of *minima secundum formam*. Indeed, the arguments provided by Boethius will prove so effective that this doctrine will, for a long time after their formulation, remain a minority position among commentators. It is ironic, be it said incidentally, that an author who is still sometimes described as a foremost "Latin Averroist" (whatever the expression is taken to mean) dealt such a serious blow to the doctrine of *minima naturalia* adopted by Averroes and inextricably linked with his *Long Commentary* on the *Physics*[538].

Both arguments adopted by Boethius, however, consider a material substance in isolation, and, as such, they cannot be taken to provide a reply also to the view of *minima secundum corruptionem*. Boethius, differently from the Pseudo-Siger, does not directly attack this view, rather, he evidently takes it to be the only one according to which it is possible to individuate *minima* in homogeneous material substances. Nevertheless, Boethius is extremely clear in explaining that the kind of *minima* warranted by such a view such a view is an extremely modest and limited one:

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[538] For a recent *mise au point* concerning the vicissitudes of the historiographical category of "Latin Averroism", and especially of the fundamental efforts, during the second half of the 20th century, to free it from the meaning of a blind adherence of a group of Latin masters (such as Siger of Brabant and Boethius of Dacia) to some (never fully and precisely identified) doctrines propounded by Averroes, see L. BIANCHI, "L'averroismo di Dante: qualche osservazione critica", *Le Tre Corone* 2, 2015, pp. 71-109, especially pp. 71-78, and also P. PORRO, *Dante anti-averroïste?*, in A. DE LIBERA, J.-B. BRENET, I. ROSIER-CATACH (eds.), *Dante et l'averroïsme (Docet omnia)*, Paris, Les Belles Lettres, 2019, pp. 117-139, J.-B. BRENET, *L'averroïsme aujourd'hui*, *ibid*., pp. 47-78, and G. FIORAVANTI, *Dante et l'historiographie de l'averroïsme*, *ibid*., pp. 403-417. For what concerns, more specifically, Boethius of Dacia's alleged "averroism", see at least L. BIANCHI, *Boèce de Dacie et Averroès. Essai d'un bilan*, in D. CALMA, Z. KALUZA (eds.), *Regards sur les traditions philosophiques (XII^e^-XVI^e^ siècle) (Ancient and Medieval Philosophy I, Vol. 56)*, Leuven, Leuven University Press, 2017, pp. 127-151.

> Maybe it will be replied: when the minimal fire in being is achieved, its power is such that it can resist the extrinsic corrupting element. But when it is divided, any divided part is of a smaller power, and any [such] part of fire is corrupted by the containing element, and so the containing [medium] will generate its form in the parts of the [contained] matter. – If so it is opposed, <I argue> differently: we talk of fire in itself without considering the containing element (*circumscripto elemento continente*); if [then] it is indicated a *minimum* in being, it is a quantity, therefore let it be divided. If in its division it is corrupted, it will already be corrupted without generation, and it cannot be said that dividing generates water or earth, etc., and so corruption [will take place] without generation and there will be pure matter (*materia nuda*)[539].

Interestingly, Boethius' strategy to limit the validity of *minima secundum corruptionem* is a mere extension of the same argument adopted against *minima secundum formam*. That is to say, Boethius imagines to consider a substance in the absence of the corrupting action of the containing medium (*circumscripto elemento continente*), via a thought experiment, and, therefore, when the substance is considered in itself, the view of *minima secundum corruptionem* will be liable to the same argument(s) presented above against *minima secundum formam* (and it will also be liable to the arguments presented against the views of *minima secundum actionem* or *operationem*, in case one were to resort to that view). Of course, this does not amount to a true refutation of the view of *minima secundum corruptionem*. What Boethius seems to be saying (and his line of criticism will be later adopted by John Duns Scotus) is that *minima secundum corruptionem* are only "extrinsic" *minima*, that is, after all, they are no *minima naturalia*, if *minima naturalia* are taken to be "intrinsic" limits to the persistence of substantial forms in material substances. Boethius' attack (together with Soctus' later one) will have a profound impact on later understandings of the very notion of *minima secundum corruptionem*. Indeed, as I will show below, while the doctrine of *minima secundum corruptionem* became the predominant one in the early 14th-century debate on *minima naturalia*, commentators adopting it were fully aware of the fact that the notion of minima they were resorting to was a merely "extrinsic" one.

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[539] BOETHIUS DE DACIA, *Quaestiones super libros Physicorum*, Liber I, q. 19, ed. SAJÓ, p. 168: "Respondetur forte: cum accipitur ignis minimus in esse, tanta est virtus eius quod potest resistere elemento extrinseco corrumpenti. Sed cum dividitur, quaelibet pars divisa minoris virtutis est, et corrumpitur quaelibet pars ignis ab elemento continente, et sic continens generabit formam suam in partibus materiae. – Si sic opponitur, <arguo> aliter: loquamur de igne in se circumscripto elemento continente, si designetur minimum in esse, quantus est, dividatur ergo. Si in sua divisione corrumpitur, iam erit corruptus sine generatione, et non potest dici quod dividens generet aquam vel terram, etc., et sic corruptio sine generatione et erit materia nuda."

It is at this point that Boethius, having refuted all the different conceptions of "intrinsic" *minima naturalia* which were part of the contemporary debate (and having limited the validity of the view of *minima secundum corruptionem* to the mere case of "extrinsic" *minima naturalia*), turns to his positive conclusion, namely, that there are no "intrinsic" *minima* in material substances:

> Because of this it is said in another way that it should not be posited a minimal fire looking at the nature of fire itself (*inspiciendo ad naturam ipsius ignis*). And this is declared in this way: if it should be posited a minimal fire, let it be posited; and it is a quantity, because it is a body, therefore divisible, because every quantity is divisible [according to] Book V of the *Metaphysics* [cf. *Metaphysics* Δ.13, 1020a7]. A quantity is divided in things which are in it: therefore either fire is divided in fires, or in two parts of matter, or in nothing, or in a body of another species. If it is divided in fire, it was not the *minimum*. If it is divided in two parts of matter, etc., then it will follow that the substance of matter is separated in act from any form, which is against [what] Aristotle [says] in Book I of *De generatione* [cf. *De generatione* I.5, 320b16-17 and 321a6-7]. In a similar way it will follow that there will be the corruption of a simple body without the generation of another simple body. If [it is divided in] nothing, it will follow that the substance of matter, which is ungenerated and incorruptible, will become nothing, which is impossible. Similarly, it will follow another inconvenient, that fire will be composed of nothing, because it is composed by those things in which it is divided. If [it is divided] in a body of a different species, such as in water or something else of this kind, it will follow that it will be generated without a generating [entity], which is inconvenient: even though dividing can divide, it cannot generate. Therefore it should not be posited a minimal fire. If you say that this minimal fire, when it is not divided, is of such power, so that it can resist the corrupting containing element, [and] immediately [once it is] divided any part of a smaller power is corrupted by the extrinsic [medium], this is excluded, because I talk of the nature of fire in itself, and I say generally: no homogeneuous body can be minimal[540].

The passage basically restates Boethius' objections to the idea of *minima secundum formam* (presenting them in a fuller dilemmatic form, including the possibility that below

[540] BOETHIUS DE DACIA, *Quaestiones super libros Physicorum*, Liber I, q. 19, ed. SAJÓ, pp. 168-169: "Propter hoc aliter dicitur quod non contingit ponere ignem minimum inspiciendo ad naturam ipsius ignis. Et hoc declaratur sic: si contingit ponere ignem minimum, ponatur ille ignis, et est quantus, quia corpus, ergo divisibilis, quia omne quantum divisibile, 5° *Metaphysicae*. Quantum dividitur in res quae sunt in eo: aut igitur ignis dividitur in ignes, aut in duas partes materiae, aut in nihil, aut in corpora alterius speciei. Si in ignem dividitur, non fuerit minimus. Si in duas partes materiae etc., tunc sequitur quod substantia materiae actualiter separata sit a qualibet forma quod est contra Aristotelem primo *De generatione*. Similiter sequitur quod erit corruptio corporis simplicis sine generatione alterius corporis simplicis. Si in nihil, tunc sequitur quod substantia materiae quae est ingenita et incorruptibilis, facta sit nihil, quod est impossibile. Similiter sequitur aliud inconveniens quod ignis componatur ex nihilo, quia ex hiis componitur in quae dividitur. Si in corpora alterius speciei, ut in aquam vel aliquod huiusmodi, sequitur quod erit generatum sine generante, quod est inconveniens: licet dividens dividere possit, generare non potest. Ergo ignem minimum non contingit ponere. Si dicas quod iste minimus ignis, cum indivisus est, tantae virtutis est, ut elemento corrumpenti continente possit resistere, statim divisus quaelibet pars minoris virtutis et corrumpitur ab extrinseco, hoc est exclusum, quia loquor de natura ignis in se, et universaliter dico: nullum corpus homogeneum potest esse minimum."

the *minima* a substance becomes a different one, pure matter, or nothing at all) and also to the idea of *minima secundum corruptionem*. Boethius is keen on stating (and repeating) that there are no *minima* in material substances considered *secundum se*. Yet, this position does not correspond to a denial of the existence of *minima naturalia tout court*, as, for instance, John Murdoch has claimed[541]. Boethius, as later Scotus, simply wants to claim that a hylomorphic compound, by its nature, has no limits in size, neither in smallness nor in greatness. It is therefore an important metaphysical concern (the fact that a synolon cannot be destroyed by a mere process of division), together with a strict interpretation of Aristotle's doctrine of substantial change (made plain by the constant reference, together with the *Metaphysics*, to *De generatione* Book I), that makes Boethius take his position. This, be it said incidentally, also brings further support to the idea, advanced in the Introduction of this thesis, that the best way to understand the Medieval Latin debate on Aristotelian *minima* is by interpreting them in the context of the issue of the persistence of substantial (or accidental) forms, rather than as an episode in the history of atomism or corpuscularianism[542].

[541] Cf. MURDOCH, *The Medieval and Renaissance Tradition of* Minima naturalia, *op. cit.*, pp. 111-112 (I have already quoted the passage above in the section devoted to Bacon, but I quote it again in full for reasons of clarity and expediency): "The denial of *minima naturalia* begins in earnest (as Anneliese Maier has pointed out) with Duns Scotus, although he has forerunners in this regard in those firmly rooted in the thirteenth century: such as Boethius of Dacia and read rightly, Roger Bacon." Needless to say, for the same reason for which I do not believe that Boethius of Dacia is a denier of *minima naturalia tout court*, but only of intrinsic *minima naturalia*, I do not believe that Scotus is a denier of *minima naturalia tout court*, but only of intrinsic *minima naturalia*, as I will show below (the reference to Maier is to MAIER, *Die Vorläufer Galileis im 14. Jahrundert*, *op. cit.*, p. 187, which, however, is only concerned with Scotus' critique of "intrinsic" *minima naturalia*). Indeed, an almost analogous argument to the thought experiment concerning the consideration of a substance in isolation from the corrupting action of the containing medium is used by Scotus, as I will show below, exactly with this same intent, i.e., that of denying that there is any intrinsic reason to posit the existence of *minima naturalia* in homogeneous material substances once the corrupting action of the containing medium has been left out of the picture.

[542] That this is so is also evident by looking at Boethius' responses *ad rationes*, which close the *quaestio* at hand: "Ad argumentum dico quod hoc [i.e., the existence of *minima* in material substances] est non propter naturam carnis vel ignis in se quin possit dividi in infinitum, sed quia contingit talem ignem ponere qui si dividatur, corrumpitur per elementum contrarium sive continens quod corrumpit partes eius circumscripto contrario agente extrinseco. Ad aliud dico quod verum est [i.e., that a material substance also has *maxima*], quia omne corpus quod augmentatur continetur infra caelum, et illud non potest augmentari in infinitum quod includitur infra caelum, sed tamen aliquod corpus, quantum de se est, potest augmentari in infinitum" (BOETHIUS DE DACIA, *Quaestiones super libros Physicorum*, Liber I, q. 19, ed. SAJÓ, p. 169).

2.9.4. The Medieval Latin Debate on *Minima naturalia* in the Central Decades of the Second Half of the 13th Century: A Summary

The 1260s mark a watershed in the Medieval Latin debate on *minima naturalia*. On the one hand, Averroes' doctrine of *minima secundum formam*, while, as seen, already present in the earlier commentary tradition (such as in Adam of Buckfield), finds its most refined and important formulation in Thomas Aquinas' *Physics* commentary (although another powerful formulation of the same doctrine can be found in Aquinas' *De sensu* commentary, as I will show in the next chapter). Aquinas is extremely clear in claiming that a body can be considered either as a continuous magniture or as a hylomorphically structured material substance (according to the Philoponean-Averroistic dichotomy). While in the former way there are no limits to its (potential) infinite divisibility, in the latter way there is a clear limit. Such a limit is due to the fact that all the substantial forms of material substances determine the maximal and minimal quantity of matter in which they can exist.

This doctrine found an important echo in the *Physics* commentary wrongly published under the name of Siger of Brabant. The Pseudo-Siger (likely Peter of Auvergne, at least for the portion of the commentary dealing with *minima naturalia*) supports Aquinas' doctrine (as Peter of Auvergne does in two texts of undisputed authenticity, his first *Quodlibet*, as I have shown above, and his commentary on the *De sensu*, as I will show in the next chapter, although with some important specifications). At the same time, he attacks the main rival positions that had been put forth in the earlier commentary tradition on the *Physics*, most notably those of *minima secundum actionem* (and *operationem*) and also the one of *minima secundum corruptionem*. The most important element to remark is the fact that the Pseudo-Siger bases his overall criticisms on a close consideration of *De sensu* 6, 445b3-446a20, which, in his analysis, becomes the key text to correctly understand the issue of *minima naturalia*.

As he notes, indeed, previous commentators (Aspall would certainly be a case in point) based the view of *minima secundum actionem* (and even *secundum operationem*) on the distinction between what is *sensibile secundum virtutem* and what is *sensibile secundum actionem* found in this text. However, as the commentator remarks, by using this distinction Aristotle only wanted to distinguish between, respectively, the parts of a

sensible whole existing potentially in it and those coming to exist in act upon separation from the sensible whole to which they belong.

Moreover, the Pseudo-Siger also remarks (this time specifically against the doctrine of *minima secundum operationem*), adopting an argument from Averroes' *Long Commentary* on *Metaphysics* Θ that would have taken centre stage in the Parisian debate on *minima sensibilia* in the early 14th century, by losing the power to perform its proper operation, an entity loses its essence, since different proper operations are what distinguish different essences.

However, as the Pseudo-Siger notes, the doctrine of *minima secundum corruptionem* does not fare any better as a doctrine of *minima naturalia*. Indeed, although Aristotle does claim, at *De sensu* 6, 446a7-10 that extremely small portions of a material substance would be dissolved in the containing medium upon separation from the whole to which they belong, this does not mean that the medium acts as a corrupting agent. On the contrary, according to the Pseudo-Siger, insofar as the celestial intelligences act on the sublunary world so as to give being to material substances, the containing medium acts as an intermediate layer in transmitting the effect of the action of the celestial intelligences on substances themselves, so that, contrary to being a corrupting agent, if anything the medium acts as a generating and preserving agent of material substances.

The criticism against all doctrines of *minima secundum actionem* and of *minima secundum operationem* is shared also by Boethius of Dacia in his *Physics* commentary. Nevertheless, Boethius takes a very different route in this respect. Indeed, rather than following the strategy adopted by the Pseudo-Siger, he claims that even if one were to assume that an extremely small portion of a homogeneous material substance existing separately from the whole to which it belongs were completely unable to act on the outside environment, still it would tend towards its natural place, and, in this sense, would still preserve the power to act so as to achieve such a place.

Boethius, however, is not content with rejecting the doctrines of *minima secundum actionem* and of *minima secundum operationem*. Rather, he also vehemently attacks any doctrine of *minima secundum formam*. His argument against it is twofold. On the one hand, he claims that this doctrine contradicts a fundamental principle of Aristotelian natural philosophy, namely the one, expressed for instance in the third chapter of *De longitudine et brevitate vitae*, according to which any corruption in nature happens due

to the action of a contrary agent. According to the doctrine of *minima secundum formam*, instead, a material substance would be corrupted even merely by dividing it in parts smaller than its *minimum naturale*. On the other hand, according to the model of corruption envisaged by the doctrine of *minima secundum formam*, it will be possible to corrupt a substance, by dividing it in parts smaller than its *minimum naturale*, without generating another substance, again contrary to a fundamental principle of Aristotelian natural philosophy, found for instance in *De generatione* I.5. According to such a principle, the corruption of a substance is always the generation of another one; otherwise, after corruption prime matter will exist without a substantial form, something utterly in contradiction with Aristotle's definition of prime matter.

Boethius is, instead, in principle amenable to accept the doctrine of *minima secundum corruptionem*, but he importantly remarks that the notion of *minimum naturale* that such a doctrine can establish is a very limited one. Indeed, according to this doctrine, it is only possible to identify a *minimum* in a material substance entirely due to an "extrinsic" reason, that is, the corrupting action of the containing medium. If, however, one were to take away this action via a thought experiment, there would be no reason to posit a *minimum naturale* in the same substance anymore.

In this sense, Boethius' discussion of *minima naturalia* represents a fundamental turning point in the Medieval Latin debate on *minima naturalia*. After it (and after the Pseudo-Siger's discussion of *minima naturalia*) doctrines of *minima secundum operationem* and of *minima secundum actionem* will mostly disappear (at least at Paris, not, however, at Oxford, where they will prosper well into the 14th century). Moreover, the strong criticism of *minima secundum formam* will make this doctrine very unpalatable and reduce it to a minority position (although such a position remained present in the subsequent stages of the Medieval Latin debate on *minima naturalia*, as the case of Thomas Wylton, discussed below, clearly shows). Finally, the way to understand the doctrine of *minima secundum corruptionem*, after Boethius' discussion of *minima naturalia*, will almost invariably be that of an "extrinsic" doctrine of *minima naturalia*. All these developments, however (and especially the last one) are not exclusively due to Boethius' discussion of *minima naturalia*, but also to John Duns Scotus' extremely influential one, to which I now turn.

2.10. John Duns Scotus on *Minima naturalia*

2.10.1. John Duns Sctous' Critique of "Intrinsic" Doctrines of *Minima naturalia*

The discussion of Scotus' position on the continuity of magnitudes as contained in Book II of the *Ordinatio* has already been analysed in Chapter 1 of this thesis. As mentioned in that context, Scotus considers the issue of *minima naturalia* in the context of arguing against the idea that magnitudes could be composed of indivisibles. The possibility that they could be composed of hylomorphic *minima* is considered after Scotus has refuted both the possibility that they could be composed of nonextended indivisible entities (geometrical points) and in the context, therefore, of a consideration of the possibility that magnitudes could be composed of extended indivisible entities. This latter possibility is clearly articulated by Scotus in two different subcases. One, which has been already discussed in Chapter 1, is that of geometric extended indivisbles (roughly, atoms). The other subcase, which is the one of interest to the present chapter, is the one which considers the possibility that magnitudes could be composed of hylomorphic *minima*, and, more specifically, *minima naturalia*[543]. As already stated in

[543] Scotus' discussion of *minima naturalia* in this section of the *Ordinatio* has received an in-depth analysis in Richard Cross' monograph on Scotus' natural philosophy, on which I already relied in the previous chapter concerning Scotus' analysis of the continuity and (potential) infinite divisibility of magnitudes in the *Ordinatio*: R. CROSS, *The Physics of Duns Scotus. The Scientific Context of a Theological Vision*, Oxford, Clarendon Press, 1998, here especially §7.3, pp. 130-133. Cross' main conclusion is that: "Scotus holds, then, that there are no physical blocks (essential to a natural substance) to infinite divisibility. His arguments are mixed, and even the least questionable of them (the third) seems overly optimistic. Whether or not there are physical blocks to infinite divisibility is in any case an empirical matter, not one which can be solved conceptually in the sort of manner attempted by Scotus" (*ibid*., p. 133). While I think Cross is right to point out that Scotus (in agreement with Boethius of Dacia) thinks that there are no *minima naturalia* in homogeneous substances considered in themselves (what I have labelled "intrinsic" *minima naturalia*), I think that the distinction between a conceptual and an empirical level of the discussion is not helpful: as I will show, Scotus seems to allow (although with some hesitation) that there are extrinsic *minima naturalia* in homogeneous substances, that is, *minima naturalia* depending on the action of the medium in which the substance is contained (*minima secundum corruptionem*). In this sense, I think, the fundamental distinction is not between a conceptual and an empirical level of the discussion, rather one between a (homogeneous) material substance considered in isolation, and the same substance considered in relation with the medium that surrounds it, or, in other tems, the distinction between "intrinsic" *minima naturalia* (the ones depending on the substance's ontological structure) and "extrinsic" ones (the ones independent from it). An updated analysis of Scotus' discussion of *minima naturalia* in this same text can be found in TRIFOGLI, "Duns Scotus and the Medieval Debate about the Continuum", *op. cit.*, esp. § 5, pp. 256-266. Trifogli's very precise reconstruction of Scotus' arguments is fundamentally in agreement with what I claim in this section. Nevertheless, in keeping with the general methodological approach adopted in this chapter (and in this thesis more generally), and largely differently from Trifogli, I will try to go beyond a mere analysis of Scotus' arguments, and I will try to put the doctrines discussed by Scotus in a more precise relation with their known historical predecessors that I have analysed above.

the previous chapter, the fact that *minima naturalia* are grouped by Scotus with geometrical *minima* does not imply that Scotus considers the former as just another kind of atoms or corpuscles, as should become clear by looking more closely at how he analyses them.

Scotus' first move, in better specifying what is at stake with the notion of *minima naturalia*, is to distinguish between three alternative interpretations of the same doctrine, based on the way in which each of them distinguishes between the aspect according to which a material substance is (potentially) infinitely divisible and the aspect according to which it is not:

1. The first interpretation would be to claim that infinite divisibility, as a property, pertains only to the matter of material substances, and not to their form, thus distinguishing between a body *mathematice acceptum*, to use Aquinas' expression, and a body interpreted as a hylomorphic compound. This interpretation, therefore, corresponds to what I have called the Philoponean-Averroistic dichotomy and is supposedly read by Scotus in connection with the doctrine that most frequently accompanies it, namely, that of *minima secundum formam*[544].
2. The second interpretation seems, instead, to be closer to the notion of *minima secundum corruptionem* (but certainly not aiming exclusively at it), and to be formulated in keeping in mind the text of *De sensu* 6 and, more precisely, its interpretation by the likes of the Pseudo-Siger. Scotus, indeed, talks in this sense of a *minimum* only insofar as capable to subsist on its own, once separated from the whole to which it belongs, and not insofar as one is considering the parts of a whole existing in it in potency[545].

[544] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 300, l. 12-p. 301, l. 2: "Vel quod 'pars secundum speciem' dicatur pars secundum formam, - 'pars autem secundum materiam' dicatur pars quanti in quantum 'quantum' est, quia quantitas consequitur materiam. Et tunc redit in quoddam antiquum dictum, scilicet quod 'quanta, secundum quod quanta, sunt divisibilia in infinitum, - non autem secundum quod naturalia'."

[545] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 301, ll. 3-8: "Vel potest intelligi 'pars secundum speciem' quae potest per se esse in actu, - et 'pars secundum materiam' dicatur pars secundum potentiam, videlicet pars ut existit in toto. Et tunc redit in idem cum alio dicto antiquo, quod 'est dare minimum, quod posset per se exsistere, - non autem est minimum in toto, quo non est minus, exsistens in eo in potentia'."

3. The third interpretation, which Scotus immediately rejects, is the idea that a material substance could have a *minimum* intended as a *minima pars* of its form. Scotus' thought seems to be that of considering the form as endowed in itself of quantitative parts ("autonomous" from the ones of matter itself, i.e., parts that the form has *per se*) and, therefore, to consider a case in which there could be parts of the matter of the substance considered existing without a corresponding part of its form. Nevertheless, Scotus immediately qualifies the content of this interpretation as *manifeste falsum*: it is inconceivable, as he remarks, that any part of the matter of a material substance, considered as conjoined to the whole to which it belongs, can be deprived of the substantial form of the material substance itself. This third interpretation (and, more specifically, the idea that substantial forms are extended entities having quantitative parts *per se*) is a remarkable novelty in the Medieval Latin debate on *minima naturalia*, a novelty that seems to prefigure some of the most important changes taking place in the 14th-century Parisian debate on *minima naturalia*. Indeed, as I will show below, the idea that substantial forms are extended entities having quantitative parts (taken to be co-located with those of the matter they inform), will constitute an important premiss of the solution to the issue of ("extrinsic") *minima naturalia* provided by commentators such as John Buridan, Nicole Oresme, and Albert of Saxony a few decades later[546].

Even though the third interpretation of *minima* is outright rejected by Scotus, what to make of the first two interpretations? Scotus starts by considering the Philoponean-Averroistic dichotomy in the formulation which he mentioned. Before presenting his own arguments *secundum rationem*, Scotus refers to some *auctoritates*. Remarkably, the second one is exactly the text of *De sensu* 6 (especially 445b20-27). Scotus' attempt to

[546] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 301, l. 9-p. 302, l. 2: "Aut potest intelligi tertio modo (discordando ab istis duobus dictis antiquis), quod sit in aliquo ut minima pars formae sive totius in quantum habet formam, et non minima pars aliqua respectu materiae sive totius illius secundum materiam. Et tunc videtur manifeste falsum, quia nulla pars materiae in toto, est sine forma in actu, - nec etiam sine forma eiusdem rationis, in totis homogeneis; immo sicut ibi 'totum' dividitur in partes homogeneas, ita materia per accidens et forma per accidens dividitur in partes suas homogeneas, - et eo modo quo minimum totius, est minimum utriusque partis, et e converso." It must be noted, in passing, that Scotus is cleary aware of the fact that this third interpretation is of an entirely different (and new) kind from the first two he provides, since he claims that this thirs interpretation is incompatible with *istis duobus dictis antiquis* and, what is more, it also appears not to have an Aristotelian basis, contrary to the previous two interpretations considered.

use the text to argue against the existence of *minima naturalia* in the Philoponean-Averroistic dichotomy is remarkable in its boldness and ingenuity, and it attests to the importance that the text of *De sensu* 6, by the time of Scotus, had acquired as probably the single most important passage to determine the issue of *minima tout court*, be they *naturalia* or *sensibilia*. As such, I deem it appropriate to quote the passage in full:

> Secondly, [I argue against the first interpretation of *minima naturalia*] by the authority of Aristotle in the *De sensu et sensato*, in that first *dubitatio* where it is argued against [the existence of *minima* of sensible qualities in the division of the matter of a material substance]. There, indeed, even though [Aristotle] solves that *dubitatio* in an obscure way, this however [he] certainly says, i.e. that 'sensible qualities are determinate according to [the division into] species' (which [he] proves, because 'where extremes are posited, it is necessary that the middle [between those extremes] are finite; as a matter of fact, in any kind of sensible qualities extremes are posited, because [they are] contrary [to each other])'. Nevertheless, regarding any single sensible quality taken alone, whether it has terminability *per se*, - it appears that [Aristotle] denies it: 'because they exist with continuity, therefore [they] have something in act, something else in potency', such as a continuous [body]; that is to say: such as 'a continuous [body]' is one [entity] *per se* in act and more [entities] in potency (in which it is by itself divisible), so a sensible quality, insofar as it exists in a continuous [body], is one in act and more in potency, even though *per accidens*. And thus once the potency of the quantity *per se* is brought to act, the potency of the passion is brought to act *per accidens*, so that a quantity is never divided through division in mathematical *quanta*; because such as he [Aristotle] argued to the question that 'a natural [body] is not composed out of mathematical parts, rather natural ones', so also in those parts – i.e., natural ones – it is divided[547].

Scotus' reference to *De sensu* 6 is, as said, elliptic: relying on the fact that, according to him, the solution to the issue of *minima sensibilia* that Aristotle provides in the text is obscure, he avoids explicitly considering it and, apart from a reference to the issue of the *numerus sensibilium*, decides to focus on one of the arguments presented by Aristotle, at the beginning of the text, in favour of the idea that sensible qualities are infinitely

[547] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 302, l. 9-p. 303, l. 13: "Secundo, auctoritate Aristotelis *De sensu et sensato*, in dubitatione illa prima ubi allegatur in oppositum. Ibi enim licet dubitationem illam obscure solvat, hoc tamen certum dicit quod 'qualitates sensibiles sunt determinatae secundum species' (quod probat, quia 'ubi extrema sunt posita, necesse est media esse finite; in omni autem genere qualitatum sensibilium extrema sunt posita, quia contraria'). Sed de quacumque una qualitate singulari, utrum ipsa habeat terminabilitatem in se, - videtur dicere quod non: 'quia exsistunt cum continuitate, ideo habent aliud in actu, aliud in potentia', sicut continuum; hoc est: sicut 'continuum' unum est per se in actu et plura in potentia (in quae est per se divisibile), ita qualitas sensibilis ut exsistens in continuo, est una in actu et plura in potentia, licet per accidens. Et tunc reducta potentialitate quanti per se ad actum, reducitur potentialitas passionis ad actum per accidens, ita quod numquam quantitas per divisionem dividitur in quanta mathematica; quia sicut ipse arguebat ad quaestionem quod 'naturale non componitur ex partibus mathematicis, sed naturalibus', ita etiam in tales partes – scilicet naturales – dividitur."

divisible *per accidens*, namely the argument according to which, if matter were infinitely divisible, but not its sensible qualities, a body would come to be composed out of mathematical (or better, geometrical, intended as non-sensible) entities, since any body is composed out of the same entities in which it is divided. Still, Scotus ingenuously uses this argument against Aristotle's solution to the issue of *minima sensibilia*. Scotus, indeed, connects this argument with a reference to the notion of act and potency (likely taken from Aristotle's "obscure" solution to the issue of *minima sensibilia*), claiming that, if, whenever for the matter of a body it is true to say that it can be infinitely divided in potency then such a potency can be reduced to act, the same necessarily holds for the sensible qualities of which matter is endowed (else the matter of material substances would turn out to be composed of parts deprived of sensible qualities). Scotus' "deviant" interpretation is all the more surprising if one considers the refined analysis that, in the context of the same *quaestio*, he provides of the notion of (potential) infinite divisibility of magnitudes, and in particular of the logical incompossibility that it entails, as analysed in Chapter 1 of this thesis. There seems to be no easy way to reconcile these two conceptions, if not, maybe, to suppose that Scotus is taking this argument straight from a previous source. I have, however, been unable to find any evidence in favour of this hypothesis.

Probably aware of the weakness of the arguments so far adduced, Scotus moves on to present his argument *secundum rationem* against the Philoponean-Averroistic dichotomy. The gist of Scotus' argument (which is too detailed and convoluted to be analysed here) is the acceptance of the general principle that when a property belongs (*convenit*) to a subject exclusively according to one of its components, it belongs to that subject *simpliciter*, regardless of its other components. Scotus' example is that of vision, which, since it belongs to man according to its eyes (the sense organ of vision), it belongs to man *simpliciter*, regardless of whether, for instance, such a man is endowed with hands or is not endowed with them. More generally, if vision belongs to any being endowed with eyes, so all the beings having eyes possess vision, regardless of whether, for instance, they have hands or not. By analogy, in the case of (potential) infinite divisibility, if such a property belongs to any entity endowed with quantity (such as any material substance), it belongs to such entity *simpliciter*, regardless of any component of that

entity different from quantity itself[548]. To be precise, Scotus is aware of the fact that the claim that (potential) infinite divisibility belongs to any entity endowed with quantity, regardless of any of its other components, is exactly what is at stake in the debate on *minima naturalia*, and specifically in the Philoponean-Averroistic dichotomy and, especially, in the doctrine of *minima secundum formam* frequently associated with it. Still, Scotus' argument seems to be, in this respect, that quantity, insofar as continuous extension, necessarily implies (potential) infinite divisibility[549]. It is therefore extremely interesting to remark that, in this sense, Scotus' refutation of the first interpretation of *minima naturalia* seems to be greatly indebted to the extended discussion of the relation of logical entailment between continuity and (potential) infinite divisibility that Scotus had conducted just before addressing the issue of *minima naturalia* in the same *quaestio* of the *Ordinatio*, as seen in the previous chapter. Nevertheless, as Scotus adds in a final twist, if there is a sense in which the Philoponean-Averroistic dichotomy is acceptable, is merely by interpreting it as saying that quantity is a formal principle of divisibility of a material substance, whereas its hylomorphic structure is not such a principle. Still, it is clear according to Scotus that the fact that the hylomorphic structure of a material substance is not the formal principle of its divisibility does not entail that such a hylomorphic structure can, in any way, constitute a hindrance to such divisibility. In the same way, although the hands are not the formal principle of vision in a given being, this does not mean that they constitute in any way a hindrance to vision[550].

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[548] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 303, l. 17-p. 304, l. 6: "Quia quando aliqua passio convenit alicui praecise secundum aliquam rationem, – cuicumque convenit aequaliter secundum illam rationem, eidem convenit simpliciter aequaliter (sicut, si 'videre' natum est praecise convenire animali secundum oculos, et non secundum manus, – cuicumque aequaliter convenit secundum oculos, ei simpliciter convenient aequaliter, licet non conveniat ei secundum manus); sed dividi in partes integrals tales, eiusdem rationis, extensas, nulli convenit nisi per quantitatem formaliter, nec maximo naturali magis quam minimo; igitur cum minimo conveniat secundum rationem istam, ita simpliciter conveniet sibi sicut maximo. "

[549] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 304, l. 7-p. 305, l. 3: "Quod si dicatur quod forma minimi prohibit istud quod competeret ex quantitate (quantum est de se, ex parte quantitates), – contra: si per se 'aliqua consequentia' sunt incompossibilia, et illa ad quae sequuntur sunt incompossibilia, – et multo magis, si ill aquae sunt de essentiali ratione aliquorum sunt incompossibilia, et ipsa erunt; sed divisibilitas in tales partes vel essentialiter consequitur quantitatem vel est de per se ratione eius (sicut Philosophus assignat rationem eius, talem qualem, IV *Metaphysicae* [cf. *Metaphysics* Δ.13, 1020a7-8]); ergo cuicumque formae naturali ponitur istud incompossibile, ei quantitas est incompossibilis, et ita non erit simpliciter divisibile in quantum 'quantum', quia simpliciter non est quantum. Hoc etiam probatur, quia non est intelligibile aliquid esse 'quantum' quin sit ex partibus, nec quod sit ex partibus quin pars sit minor toto; et ita non est intelligibile quod aliquid sit quantum indivisibile, ita quod non sit aliquid in eo, minus eo, inexsistens sibi."

[550] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 305, l. 10-p. 306, l. 6: "Dico igitur quod ista responsio de naturali in quantum 'quantum' et in quantum 'naturale', si potest habere aliquam

After having discussed the Philoponean-Averroistic dichotomy (a discussion that, as said, certainly extends in a particularly important way to the doctrine of *minima secundum formam*), Scotus turns to the second interpretation of *minima naturalia* he mentioned. This interpretation, as said, distinguishes between the parts of a material substance insofar as they exist in the whole to which they belong and insofar as they exist separately from it (and, therefore, such an interpretation inevitably connects with the doctrine of *minima secundum corruptionem*).

Scotus' general strategy to argue against this second interpretation is largely analogous to the first one. Indeed, as in arguing against the first interpretation he had claimed that, insofar as the property of (potential) infinite divisibility essentially belongs to quantity, it belongs to any entity endowed with quantity, he now claims that, insofar as the property according to which the "products of division" can have separate existence essentially belongs to quantity, it essentially belongs to any entity endowed with quantity (and to all of its parts)[551]. Evidently, the two cases are not analogous as Scotus' discussion might make them appear. Indeed, it is rather uncontroversial to claim that the property of divisibility essentially belongs to an entity insofar as it is endowed with quantity, but it is more difficult to see how Scotus can claim that the property according to which its parts are capable of separate existence can belong to an entity insofar as it is endowed with quantity.

Scotus seems to be aware of this difference, since, the argument he uses in support of his line of reasoning against the second interpretation is not merely (or even predominantly) formulated by reference to quantity, but rather by reference to the hylomorphic structure of homogeneous material substances (on which his discussion of

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veritatem, debet intelligi affirmando et negando rationem formalem divisibilitatis, ita quod ill aquae dicit quod dividitur in quantum 'quantum', dicit quod dividitur in quantum 'naturale', et quae dicit quod non dividitur in quantum 'naturale', negat naturalitatem esse rationem huius divisionis, – sicut si diceretur quod animal in quantum habet oculos videt, non in quantum habet manus; et iste intellectus verus est. Sed ex hoc non sequitur quod non simpliciter ei conveniat quod convenit ei secundum quantitatem: non enim per naturalitatem concurrentem impeditur illud quod convenit naturaliter quantitate, sicut nec per manus concurrentes in animali tollitur illud quod simpliciter convenit ei secundum oculos. Ita igitur, absolute, est omne 'naturale' divisibile in semper divisibilia (in infinitum), sicut si illa quantitas quae est cum forma naturali esset per se, sine omni forma naturali. Et ita omnes rationes quae procedunt de quantitate absolute (secundum rationem quantitates), concludunt de ea u test in naturalibus, quia divisibilitas est passio naturalis eius, – et ex consequente concludunt de naturali, cuius est haec passio."

[551] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 306, ll. 17-20: "Sed contra istam responsionem [i.e., the second interpretation of *minima naturalia*] arguo: quia sicut essentiale est 'quanto' posse dividi in partes, ita est ei essentiale quod singulum eorum in quae dividitur, posset esse hoc-aliquid; igitur nulli eorum repugnant per se esse."

minima naturalia is focused). The argument used by Scotus is exactly the same that had been used in the early Oxford commentary tradition to deny the existence of "intrinsic" *minima naturalia* in homogeneous material substances, at least since the *Physics* commentary attributed to Richard Rufus of Cornwall. This is the argument that claims that, by the very definition of a homogeneous material substance, all the parts in which it is divided must have the same nature (and therefore the same form, although the argument is not originally formulated in hylomorphic terms) as the whole to which they belong. More precisely, as Scotus interprets it, if in a homogeneous material substance all the parts have the same nature of the whole (and therefore the same form), insofar as the property of existing on its own belongs to the whole in virtue of its nature, so it belongs to any of its parts (not merely, evidently, the property of existing on its own, but of existing on its own with the same nature, and therefore the same form, as the whole)[552]. Although Scotus does not say so, it seems clear from the context of his discussion that this argument does not merely extend to the doctrine of *minima secundum formam* (thus to the doctrine focusing on the existence of the substantial form of homogeneous material substances existing separately from the whole to which they belong), but also to all doctrines of *minima secundum operationem*. Indeed, as noted above, the argument is used in this way by Bacon in his *Physics* commentary. In this sense, therefore, the arguments provided by Scotus against the first two interpretations of *minima naturalia* that he has distinguished can be taken to represent, together, a powerful refutation of all doctrines positing "intrinsic" *minima naturalia* (save for the doctrine of *minima secundum sensum*, although, as said above, this represents a limit-case of "intrinsic" doctrines of *minima naturalia* – and indeed, as I will show below, Scotus explicitly endorses the existence of such *minima* in material substances).

Still, as Scotus remarks, the argument he has provided against the second interpretation does not apply to the claim that the parts of a given homogeneous substance cannot exist on their own separately from the whole to which they belong insofar as they

[552] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 306, l. 21-p. 307, l. 7: "Confirmatur ista ratio et consequentia ista: Tum quia partes istae sunt eiusdem rationis, quantum ad materiam et formam, cum toto; igitur possunt habere per se exsistentiam, sicut et totum potest. Tum quia si essent per se, essent individua illius speciei cuius 'totum' est individuum; absurdum autem videtur quod aliquid habeat in se naturam illam unde sit individuum (vel possit esse individuum) alicuius speciei, ita quod sibi non repugnat posse esse individuum illius et repugnat sibi posse esse simpliciter, et hoc saltem de illis quae non sunt accidentia (loquimur modo de substantiis homogeneis, quae non inhaerent essentialiter)."

would be resolved in the containing medium. That is to say, the argument has nothing to say against the doctrine of *minima secundum corruptionem*. Scotus, therefore, presents an independent argument against it. Interestingly, Scotus adopts the same argumentative strategy adopted by Boethius of Dacia, that is, he shows that (putting into parentheses, or *circumscribendo*, to use Boethius' verb, the corrupting action of the containing medium), the position of *minima secundum corruptionem* does not bring any intrinsic reason to posit *minima* in homogeneous material substances. Thus, in looking at Scotus' discussion of *minima secundum corruptionem*, it is possible to identify a true *impasse* in the Medieval Latin debate on *minima naturalia*. On the one hand, Scotus masterfully shows that such a view is fully compatible with the denial of any kind of intrinsically determined *minima naturalia* (in Boethius' wake). Nevertheless, Scotus, contrary to what he purported to do, is incapable of presenting a single argument agains the existence of extrinsically determined *minima naturalia*, that is, *minima* depending on the corrupting action of the containing medium of material substances. This *impasse*, as I will show in the rest of the Chapter, was to have profound consequences on the 14th-century debate on *minima naturalia* in the Latin world.

That this is so is clearly demonstrated from the passage that follows:

> And if you say that it [an extremely small part of a material substance] were immediately converted into the containing [medium], – this reply will not seem to be appropriate to the question. Indeed, we inquire into a minimum which could be by itself according to an intrinsic cause (*ex ratione intrinseca*), […]; however, no intrinsic cause of incompossibility is assigned, if it is entirely corrupted[553].

After this clear statement of the fact that *minima secundum corruptionem* cannot in any way provide an argument in favour of the existence of "intrinsic" *minima naturalia* in material substances (and are therefore fully compatible with its denial), Scotus goes on to provide a thought experiment aimed at supporting his position, a thought experiment that, by the way, articulates in a more explicit way what Boethius presumably intended with his use of the expression *circumscripto continente*:

> Indeed, let us circumscribe (*circumscribamus*) every containing [medium] and any corruptive [agent], and [let us assume] that there is only water in the universe; let

[553] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 308, ll. 1-3; 5-6: "Et si dicas quod statim converteretur in continens, – responsio ista non videtur esse ad intellectum quaestionis. Quaerimus enim minimum, potens per se esse ex ratione intrinseca, […]; nulla autem ratio intrinseca huiusmodi incompossibilitatis assignatur, si totum corrumpatur."

> any given water be divided, because this is possible, as it has been proved against the first answer [i.e., when arguing against the Philoponean-Averroistic dichotomy as formulated by Scotus]. Those into which the division results are not nothing (*nihila*), because this is against the nature of division, – nor will they be non-water (*non-aqua*) by the mere nature of division, because then water will be composed of non-waters (*non-aquis*); nor even is incompatible with the form of water this smallness that is already in act, because this 'small [part]' existed before (even though in a whole), – nor by division itself water is corrupted, because any corruptive [agent] has been circumscribed[554].

This passage takes the same dilemmatic structure (although a more parsimonious one) already seen in Boethius to deny that division by itself, in the absence of the corrupting action of the containing medium (or of any other entity), could ever bring to the corruption of a material substance. The basic idea underlying Scotus' view of the refutation of any kind of "intrinsic" *minima* in material substances seems to be the same than Boethius, although it is not explicitly stated. The corruption of a material substance always requires, for Scotus as for Boethius, the corrupting action of a contrary agent. Division by itself is never sufficient to bring about a substantial change. Again, the line of argument adopted to deny the existence of "intrinsic" *minima naturalia* is a metaphysical one, certainly closer to the metaphysical category of persistence than to any atomistic or corpuscularian framework. Nevertheless, as said, Scotus, as Boethius before him, does not take issue with the view of *minima secundum corruptionem* proper, although he is far from unambiguously endorsing it[555].

Given the position adopted by Scotus, one last task remains for him to perform, something which had not been attempted by Boethius, that is, that of providing an explanation consistent with his view of all the Aristotelian *auctoritates* apparently arguing for the existence of some sort of "intrinsic" *minima naturalia* in homogeneous material substances. Scotus' reply is to be found in the *responsio ad rationem* of the same *quaestio*, after he has fully discussed all the arguments in support of the view that a

[554] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 308, ll. 6-15: "Circumscribamus enim omne continens et omne corruptivum, et quod sola aqua sit in universo; quaecumque aqua data dividatur, quia hoc est possible, ut probatur supra contra primam responsionem. Illa in quae fit divisio, non erunt nihila, quia hoc est contra rationem divisionis, – nec erunt non-aqua, ex sola ratione divisionis, quia tunc aqua componeretur ex non-aquis; nec etiam repugnant formae aquae ista parvitas quae iam est in actu, quia ista 'parva' praefuit (licet in toto), – nec per ipsam divisionem corrumpetur aqua, quia circumscriptum est omne corruptivum."

[555] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 308, ll. 15-19: "Non igitur videtur aliqua ratio intrinseca quare naturali repugnet quin semper, quocumque per se exsistente, posset aliquod minus esse per se exsistens, licet forte ratio extrinseca impeditive talis 'per se exsistentiae' assignetur contrarietas corrumpentis."

successive entity is composed of indivisibles, arguments which have already been object of analysis in Chapter 1.

The first passage considered by Scotus is, evidently, *Physics* I.4. Scotus' interpretation of the true meaning of the passage is ingenuous, and it attests to a high degree of originality when compared with the previous commentary tradition, as presented in this chapter. Scotus' basic idea is to distinguish between two similar, but not identical, concepts, i.e., between a *minimum naturale* as the smallest size in which a material substance can persist in existence, and a *minima materia* as the smallest quantity of matter required for the generation of a given material substance. While Aristotle certainly admitted the existence, due to fully "intrinsic" reasons, of a *minima materia* for the generation of a homogeneous material substance, he certainly did not support, in the text, the claim that there are in these same substances "intrinsic" *minima naturalia*[556]. The distinction between the issues of *minima naturalia* and of *minima materia*, generally not discussed in the context of commentaries on *Physics* I.4 from the 13th century, would become common in 14th-century commentaries, as I will show below. One of the main reasons for this change (albeit certainly not the only one) seems to have been, in this as in the general analysis of *minima naturalia*, the influence of Scotus' interpretation.

After having so explained Aristotle's intention in *Physics* I.4, Scotus, significantly, turns to one of the other main Aristotelian *auctoritates* usually adduced in favour of the existence of "intrinsic" *minima naturalia*, i.e., *De sensu* 6, 445b3-446a20. Scotus is less original in his interpretation of the passage, which, be it said incidentally, amounts to his (only) explicit consideration of the issue of the accidental divisibility of the forms of sensible qualities in their own right. In the passage, Scotus adopts a position (which concerns *minima naturalia* as well as *minima sensibilia*) akin to that of Bacon's *Physics* commentary, i.e., the one which I have called *minima secundum sensum*. Scotus, indeed,

[556] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 325, l. 11-p. 326, l. 6: "Ad primam, quod Philosophus contra Anaxagoram habet satis si, per ablationem a toto, minoretur totum, ita quod non semper possit de eo aequale subtrahi; oportebat enim Anaxagoram dicere (sicut imponebat ei Aristoteles) quod facta segregatione a carne cuiuslibet generabilis de carne, quod adhuc remaneret caro tanta ut ex ea posset ulterius segregari quodcumque generabile: et hoc est impossibile, quia quantumcumque caro posset in infinitum dividi et minorari, saltem non maneret tanta ut posset ex ea quodcumque generabile generari, *quia generabile quodcumque requirit determinatam quantitatem illius ex quo generatur* (maxime si generatio sit tantum segregatio vel motus localis, quod imponitur Anaxagorae, et ultra omnem quantitatem illam ex qua generatur, minoretur caro per continuam segregationem aliorum ex ipsa). Non igitur propter intentionem Aristotelis ibi, oportet ponere minimum in naturalibus etiam separatum, per se exsistens, nec in toto" (my emphasis).

is adamant in his statement that sensible qualities are accidentally infinitely divisible, because it is not possible to posit, in nature, the existence of a quantitative extension deprived of sensible qualities. Yet, this does not mean that such sensible qualities are always perceptible by the external senses (although Scotus does not explicitly state whether he takes "imperceptible" sensible qualities to be still capable to act or ot be entirely "inactive", the former position seems more likely, given the arguments presented in his discussion, especially, of the second interpretation of *minima naturalia*). This is, Scotus believes, the way in which the Aristotelian claim that sensible qualities are infinitely divisible *virtute*, but not *actione*, should be interpreted, and not in the sense of any limit to the existence of sensible qualities in act[557]. Scotus' full passage is as follows:

> To that [*auctoritas*] of the Philosopher in the *De sensu et sensato* I say that passions are infinitely divisible in any case, so that a 'quantum' could not be divided if not once the passion had been divided; and, nevertheless, it is not infinitely divided insofar as [it is] sensible (i.e., insofar as it is perceptible by the sense), such as he [Aristotle] means where [he says] that 'a part [of a material substance], however small, can be sensible by power (*virtute*), even though not by action (*actione*)': this amounts to say that in the whole it can cooperate with the other parts to modify the sense, – and, nevertheless, even though division can happen in it even when existing by itself, still it will not modify the sense[558].

[557] Scotus, as it should be clear, is here relying on the *translatio vetus* of the *De sensu*. While this could of course be due to the fact that the text is less evidently positing a limit to the existence in act (*actu*) of sensible qualities in extremely small sizes of matter, I believe that it might also be due to the fact that Scotus is here restating a position dating back to those commentators who, such as Bacon, developed it having at their disposal only the *translatio vetus*. Notice also in passing that here Scotus does not claim anymore that Aristotle's solution to the issue of the infinite divisibility of sensible qualities *per accidens* is obscure, as he had claimed before. Rather, he provides a very precise interpretation of it. This seems to be another reason to believe that Scotus is here mostly restating a position he took from one of his sources.

[558] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 326, ll. 7-15: "Ad illud Philosophi *De sensu et sensato* dico quod passions sunt divisibiles quantumcumque, ita quod non posset 'quantum' dividi nisi divisa passione; et tamen non dividitur in infinitum in quantum sensibilis (id est, in quantum est perceptibilis a sensu), sicut ipse vult ibi quod 'pars quantumcumque minima potest esse sensibilis virtute, licet non actione': hoc est quod ipsa in toto potest cooperari aliis partibus ad immutandum sensum, - et tamen licet posset fieri divisio in eam etiam per es exsistentem, non tamen immutaret sensum." It is noteworthy that Scotus, in this passage, not only quotes *De sensu* 6 using the *translatio vetus* (contrary to what he did earlier in the same discussion, where he explicitly referred, as shown above, to the existence in potency and in act of sensible qualities in the continuum while considering *De sensu* 6), but that he does also explain the notion of sensible *actione* as implying the ability to act on the senses, and viceversa that of sensible *virtute*. Still, it is unclear in the passage, as in Scotus' discussion of *minima sensibilia* in this context more generally, whether he takes sensibles *virtute* to be "active" towards the senses (according to Bacon's own position and to the predominant view of the Oxford *De sensu* commentary tradition of the 13th and of the 14th century, or whether he takes them to be "inactive", i.e., to completely lack the power to act on the senses, according to the predominant view in the Parisian *De sensu* commentary tradition of the 13th and of the 14th century. On the whole issue, see Chapters 3 and 4 of the thesis.

The fundamental implication of Scotus' position (such as of Bacon's one) is that sensible qualities can exist on their own without being perceptible (at least as a conceptual possibility, that is, in the absence of the corrupting action of the containing medium). While this implication is left completely unanalysed by Scotus (as it had been by Bacon in his *Physics* commentary), it is hard to see how it could be accepted without a justification, since it amounts to a full-fledged rejection of the Aristotelian principle according to which the essence of a sensible quality is defined by its ability to operate on the corresponding external sense. The contradiction inherent in assuming the existence on their own of "imperceptible" sensible qualities is most forcefully denounced, and resolved in an original way, by John of Jandun in his commentary on *De sensu* 6. This text, however, and all the debate concerning "imperceptible" sensible qualities existing on their own, will be discussed in detail especially in Chapter 4, in the context of an overall study of the Medieval Latin debate on *minima sensibilia*. For now, suffice it to say that Scotus does not point to any solution to the contradiction that, in Aristotelian terms, his position implies. Rather, he goes on at the end of the passage quoted to restate that the objection to the (potential) infinite divisibility of sensible qualities according to which, if they were infinitely divisible, the power of the sense should grow to infinity (the fundamental argument presented at the beginning of *De sensu* 6 by Aristotle against the possibility of potential infinite divisibility *per accidens* of sensible qualities) simply applies to the sense, but it does not affect in any way the possibility to infinitely divide sensible qualities *per accidens*, thus clearly implying, once again, the possibility of the existence on their own of "imperceptible" sensible qualities:

> And so it is clear in respect to the argument – which is presented against [the infinite divisibility of sensible qualities *per accidens*] – according to which 'the sense grows to infinity, if it is posited' etc.: it is true, if the sensible, insofar as it is actually perceptible by the sense, could be infinitely divided, - it does not follow, however, if that which is sensible could be infinitely divided[559].

The interest of this last remark lies also in the fact that Scotus seems to be aware of the fact his own understanding of what is sensible is different from the traditional definition of 'sensible', according to which what is sensible corresponds to what can be perceived

[559] Cf. IOANNES DUNS SCOTUS, *Ordinatio*, Liber II, d. 2, p. 2, q. 5, p. 326, ll. 16-20: "Et tunc patet ad argumentum eius – quod adducitur in oppositum – quod 'sensus crescit in infinitum, si apponatur' etc.: verum est, si sensibile, in quantum actu perceptibile a sensu, posset dividi in infinitum, - non autem sequitur si illud quod est sensibile, potest dividi in infinitum."

by the external senses. He, however, does not even hint at how, then, 'sensible' should be defined according to him. One must wait John of Jandun's solution (in his commentary on *De sensu* 6, which will be examined in Chapter 4) to start seeing the detailed articulation of a possible alternative.

2.10.2. John Duns Scotus on *Minima naturalia*: A Summary

Scotus' discussion of *minima naturalia* in the second Book of his *Ordinatio* is part of his more general refutation of all theories that posit some sort of "indivisibles" as the ultimate components of continuous magnitudes (and, correlatively, of continuous motions and of continuous times). Evidently, *minima naturalia* (which are discussed by Scotus as physical extended indivisibles) are not indivisibles in the sense atoms are. Still, insofar as *minima naturalia* are thought to provide a "block" to the "physical" divisibility (i.e., the real separation of part from part) of material substances, they become part of the same discussion.

Scotus' position, based on a peculiar classification of doctrines of *minima naturalia*, is that there can be no "intrinsic" *minima naturalia* in material homogeneous substances (and especially no *minima secundum formam*). The arguments used by Scotus in this respect are mainly two. Against the idea, based on the Philoponean-Averroistic dichotomy between a body *qua* continuous magnitude and a body *qua* material substance, that a body is (potentially) infinitely divisible insofar as it is a continuous magnitude, but that the substantial form might constitute a "block" to such divisibility, determining the minimal quantity of matter in which it can exist (or operate), Scotus remarks that (potential) infinite divisibility belongs to a material substance exclusively in virtue of quantity. More than that, insofar as a substance has quantity, it necessarily also has the property of (potential) infinite divisibility. No other "component" of an entity having quantity can prevent it from having (potential) infinite divisibility. In the same way, to use Scotus' example, insofar as some being has the eyes (i.e., the sense organ of vision), such a being necessarily also has vision. None of its other components, such as the hands, can prevent it from having vision. If anything, one could say that what the Philoponean-Averroistic dichotomy really amounts to is the identification of what is the formal principle of (potential) infinite divisibility. Read in this way, the dichotomy simply says

that the formal principle of (potential) infinite divisibility in a substance is quantity (i.e., continuous extension) and not the substantial form.

Even if one were to claim that the existence of *minima naturalia* in homogeneous material substances depends on the fact that, once extremely small portions of a material substance are separated from it, they cannot exist on their own, the same basic response would apply. Only, this time Scotus does not make appeal to the property of (potential) infinite divisibility as necessarily following from an entity having quantity, but he rather focuses on a different property. Scotus' argument here, which is basically the same already encountered in the early Oxford Physics commentary tradition, such as in the *Physics* commentary attributed to Richard Rufus of Cornwall, according to which any part of a homogeneous whole must have the same nature of the whole itself, in virtue of the very definition of a homogeneous body. That is to say, according to Scotus, insofar as any part of a homogeneous whole, exactly because it is part of a homogeneous (as opposed to a hetereogeneous) whole, has the property of being of the same nature as the whole, it also has the property of being capable of existing on its own (as the whole), with the same nature as the whole. The argument, while primarily applying to the issue of the existence on their own of parts separate from the whole to which they belong, can also be extended to the issue of the ability of such parts to act (after all, the argument as present in the *Physics* commentary attributed to Rufus had been reformulated exactly in this direction by Roger Bacon in his own *Physics* commentary).

Still, in considering the apparently contrary auctoritas of *Physics* I.4, Scotus explicitly distinguishes between the issue of the existence of "intrinsic" *minima naturalia* in homogeneous material substances and that of the existence of a *minima materia* in which the substantial form of such substances could be generated. According to Scotus, Aristotle's text should not be interpreted as positing "intrinsic" *minima naturalia* in homogeneous material substances (in fact, there are none), but as positing a *minima materia* in such substances (something that Scotus appears to concede). This is a very important distinction that, as I will show below, will be fully articulated in the 14th-century debate on *minima naturalia*.

Moreover, much like Bacon in this respect, Scotus, in considering Aristotle's apparently contrary position in *De sensu* 6, explicitly admits that this does not mean that there cannot be, in homogeneous material substances, *minima secundum sensum*, that is,

minima that do not depend on the substance themselves being perceived, but rather on the limitations of the sensory powers to perceive extremely small portions of a homogeneous material substance existing on their own. Unfortunately, Scotus does not articulate his conception any further, so that it is impossible to determine whether he thinks that this "imperceptible" portions of homogeneous material substances could exist in the actual world, or only as a conceptual possibility, and he does not even say whether (as Bacon does) he believes that the sensible qualities of these "imperceptible" portions of material substances would still have the power to act on the senses or, on the contrary, they would be completely "inactive" (the former seems the more likely alternative, however, given his overall discussion).

Scotus also explicitly considers the doctrine of *minima secundum corruptionem*. His view in this respect is very close to the one articulated by Boethius of Dacia. Scotus, indeed, like Boethius, remarks that this doctrine cannot establish anything more than the existence of "extrinsic" *minima naturalia* in homogeneous material substances, that is, *minima naturalia* determined by an entirely "extrinsic" cause. In this sense, he is ready to admit that it is indeed the case that, in the actual world, extremely small portions of homogeneous material substances existing on their own would be corrupted by the containing medium. Nevertheless, as he claims by resorting to a thought experiment concerning a world entirely composed of one substance, namely, water, in such a world (where there could be no containing medium and, therefore, no external corrupting agent) there would be no *minima naturalia* at all in the substance exclusively composing that world.

All in all, Scotus' criticism of any notion of "intrinsic" *minima naturalia* (apart from the limit-case of *minima secundum sensum*), and the limitation of the scope of the doctrine of *minima secundum corruptionem* to a purely "extrinsic" notion of *minima naturalia* was to have a wider impact in the 14th-century debate on *minima naturalia* (an impact certainly also due in part to Boethius of Dacia's similar criticisms). This impact, however, manifested itself in two fundamentally different ways at Oxford and at Paris. While, at Paris, Scotus' (and Boethius') criticisms contributed to a decisive rearticulation of the terms of the debate, at Oxford Scotus' criticisms seem to have deprived the topic of *minima naturalia* of its intrinsic theoretical interest (although this was also certainly due to the regain of interest for the debate on indivisibilism). Indeed, it is really hard to

find an extended discussion of the issue of *minima naturalia* in early 14th-century Oxford commentators. Their remarks on this issue are scant at, in most cases, they just amount to the adherence to one of the traditional positions already present in the early Oxford *Physics* commentary tradition. Nevertheless, before getting to the analysis of these developments, it is important to consider the developments in the debate on *minima naturalia* around the time of Scotus, that is, between the end of the 13th century and the beginning of the 14th century. To them I now turn.

2.11. The Medieval Latin Debate on *Minima naturalia* between the End of the 13th Century and the Beginning of the 14th Century

2.11.1. Thomas Wylton on *Minima naturalia*: Averroes' *Minima secundum formam* in the Oxford Debate on *Minima naturalia* at the End of the 13th Century

One feature that seems to characterise the Oxford debate on *minima naturalia* in the second half of the 13th century (before Scotus' discussion of the issue), as I have mentioned above, is the persistence of the position of *minima secundum actionem*, best epitomised in Aspall's *Physics* commentary.

Nevertheless, such a position is far from being the only one circulating at Oxford at that time. A particularly interesting case to study in this respect is Thomas Wylton's *Physics* question commentary. The commentary, a highly original and theoretically rich work, is to be dated, presumably, between the last decade of the 13th century and 1304, when Wylton, fellow of Merton College from around 1288 until 1301, and Master of Arts until 1304, left Oxford to study theology at Paris, where he became a Master of Theology in 1312. Evidently, without a full edition of the commentary, and especially of the commentary on *Physics* I.4, it is not possible to draw any definitive conclusion in this respect[560]. Nevertheless, the text of q. 25 on Book I of the *Physics*, *An contigat accipere*

[560] A full edition of the commentary is, nevertheless, in preparation by Cecilia Trifogli, as announced in C. TRIFOGLI, "Thomas Wylton against Minimal Times", *Early Science and Medicine* 8 (4), 2003, pp. 404-417, p. 404. Note that in the same article Cecilia Trifogli has edited and studied a question from Wylton's commentary on *Physics* IV.10 concerning the existence of minimal times (*ibid.*, pp. 414-417). While Wylton's basic restatement of the Philoponean and Averroistic distinction between a body considered *qua* continuous magnitude and a body considered *qua* material substance is present, Wylton's considered position on *minima naturalia* is not invoked in that context.

universaliter minimum naturale, et loquitur secundum esse eius naturale, quia secundum esse continuum certum est quod non, is so significant that I deem it worthy to analyse it here, albeit in a very brief way, insofar as I only rely on one of its manuscript witnesses[561].

The first important aspect to remark is that Wylton discusses *minima naturalia* within the framework of the Philoponean-Averroistic dichotomy between a body considered *qua* continuous magnitude and a body considered *qua* material substance[562]. This would already represent a significant conceptual shift when compared with previous, mid-13th-century Oxford commentators. Indeed, such commentators, as I have shown above, largely refuse to have recourse to this dichotomy in their discussion of *minima naturalia* and, rather, tend to oppose it by having recourse to the definition of homogeneous material substances as bodies where the parts are identical in nature to the whole to which they belong. Not only does Wylton have recourse to the dichotomy, contrary to the habit of his predecessors, but he even uses it to show that the definition of homogeneous material substances cannot in any way provide an argument against the existence of "intrinsic" *minima naturalia*, or, to be more precise, against the idea that the nature of the parts of a given portion of a homogeneous material substance cannot change, below a certain threshold of smallness.

Indeed, the most interesting aspect of the use of the dichotomy by Wylton is exactly the fact that he interprets it in the proper Averroistic sense, that is, in connection with the acceptance of the existence of *minima secundum formam* for (all) material substances. As Wylton explicitly states in the last argument *quod sic* of his *quaestio* devoted to *minima naturalia* in the commentary on *Physics* I.4:

> Again, [the existence of *minima naturalia* for material substances can be demonstrated] according to [this] argument: substantial form is the first number of matter (*numerus materie*), and to it follows another and then another number of quantity, and therefore we see that <from> another and another specific form follows another and another number of quantity, and another shape; therefore, from a certain

[561] The commentary is preserved in ms. Cesena, Biblioteca Malatestiana, Plut. VIII sin. 2, ff. 4r-141v, Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 4709, ff. 1r-143r, Erfurt, Stadtbibliothek, Ampl. Fol. 178, ff. 57r-73v (only Book VII and Book VIII), and, finally, Madrid, Biblioteca Nacional, 2015, ff. 1r-217v. In what follows I quote the text exclusively from the Vatican manuscript.

[562] THOMAS WYLTON, *Quaestiones super Physicam*, Liber I, q. 25, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 4709, f. 10vb: "Queritur an contingat accipere [...] minimum naturale, et loquitur secundum esse eius naturale, quia secundum esse continuum certum est quod non, ut postea videbitur."

> substantial form follows a certain degree of quantity, and [a degree] determined in magnitude and in smallness, what I concede[563].

Apart from the peculiar terminology adopted by Wylton in this passage, with his reference to the 'number' and to the 'degree' of quantity which, as he claims, is attributed to matter by substantial form, it is clear that Wylton is here claiming that substantial forms metaphysically determine the quantity of matter which they can inform. More than that, Wylton also explicitly adheres to the idea that each substantial form has its own quantity of matter which it can inform, so that not all substantial forms (even just concerning homogeneous material substances) can inform the same quantity of matter. It seems hard, therefore, to deny that Wylton is adhering to the view of *minima secundum formam*. Of course, Wylton is not influenced by Aquinas and Auvergne and, more generally, by the Parisian tradition in this respect (importantly, not even by the Parisian criticisms of such a view, since he does not refer to Boethius of Dacia's arguments against it in the *quaestio*). More simply, he evidently takes this to be (rightly, I believe) the correct interpretation of Averroes' doctrine of *minima naturalia*. Unfortunately, Wylton does not explicitly invoke Averroes' authority to ground his view, but the strong presence of Averroes' in the *quaestio* (as in Wylton's *Physics* commentary more generally) leaves little doubt in this respect.

This finding interestingly shows that the view of *minima secundum formam* remained an available option (although a minority one) for Medieval Latin commentators thanks to the constant influence of Averroes' *Long Commentary* on the *Physics*. This remains true, as I will briefly mention in the Conclusions of the chapter, not only for the 13th and the 14th century, but also for the 15th and the 16th ones, with important doctrinal consequences.

What is more, Wylton also uses the view of *minima secundum formam* to contrast the traditional Oxford argument against intrinsic *minima naturalia* (especially threatening, indeed, for *minima secundum formam*) based on the definition of homogeneous material substances:

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[563] THOMAS WYLTON, *Quaestiones super Physicam*, Liber I, q. 25, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 4709, f. 11ra: "Item, per rationem: forma substantialis est primus numerus materie et ad ipsam sequitur alius et alius numerus quantitatis, et ideo videmus quod <ad> aliam et aliam formam specificam consequitur alius et alius numerus quantitatis, et alia figura; ergo ad distinctam formam substantialem consequitur distinctus gradus quantitatis et determinatus magnitudine et parvitate; quod concedo."

> To the first [argument] to the contrary [i.e., that homogeneous material substances are divisible in parts that have the same nature as the whole, so that there are no *minima naturalia* in them]. […] This must be denied. Indeed, the species [i.e., the substantial form] while existing in [the substance considered] is of a determined power, and a determined power needs a determined quantity, and through this Aristotle demonstrates in Book VIII [of the *Physics*] that neither is there a finite power in an infinite magnitude, nor the contrary. Therefore I say that the quantity which is required by the form so that it cannot be preserved in a smaller one is determined[564].

What is noteworthy in the passage is not only the more explicit restatement of Wylton's adherence to the view of *minima secundum formam*, but also his appeal to the power (*virtus*) of substantial form as the determining notion grounding this view. What Wylton has in mind here is certainly not the power required to a substantial form in order to perform its proper operation, rather the power required to it in order to persist in existence as the substantial form of a given hylomorphic compound (the so-called *virtus conservans* to which, significantly, Aquinas will appeal in his discussion of *minima sensibilia*, as it will be shown in the following chapter, and to which also the Pseudo-Siger, as seen, appeals in his *Physics* commentary).

It is not surprising at all, then, that, later in his *Physics* commentary, when discussing the existence of minimal times, Wylton even reinterprets the dichotomy between a body *qua* continuous magnitude and a body *qua* material substance as being a dichotomy between the matter and the form of a material substance[565].

All in all, Wylton's position on *minima naturalia* contributes to show that the debate on the issue at Oxford around the turn of the century is not limited to a discussion of the notion of *minima secundum actionem* under the influence of Aspall's *Physics*

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[564] THOMAS WYLTON, *Quaestiones super Physicam*, Liber I, q. 25, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 4709, f. 11ra: "Ad primum in contrarium. [...] Hoc est negandum. Nam species inexistendo est determinate virtutis, et determinata virtus exigit determinatam quantitatem, propter quod probat Philosophus in octavo quod nec virtus finita est in magnitudine infinita nec e contrario. Ideo dico quod determinata est quantitas que requiritur forme ita quod in minori non potest salvari."

[565] The most explicit statement of the dichotomy in these terms is contained in the *quaestio* on *Physics* IV.10 edited by Trifogli: "Supposita igitur hac distinctione [i.e., between matter and form] tanquam propria, dicunt quod, sicut in carne est accipere minimam carnem secundum formam, scilicet inquantum naturalis est, quamvis secundum materiam et naturam continui sit divisibilis in infinitum, ita dicunt quod, cum visibilitas in motu sit a divisibilitate magnitudinis et divisibilitas temporis a divisibilitate motus, ut dicunt, ex parte temporis et motus eodem modo est conveniens haec distinctio" (TRIFOGLI, "Thomas Wylton against Minimal Times", *op. cit.*, pp. 414-415, <3>). It is also significant to remark that Wylton, in this way, even has explicit recourse to the expression of *minima carnem secundum formam*, therefore providing some support to my choice of the expression to characterise this position on *minima naturalia*.

commentary. Nevertheless, Wylton's discussion of *minima naturalia* testifies to the fact that the debate on *minima naturalia* at Oxford (and, significantly, at Merton College more specifically) at the beginning of the 14th century is still largely conducted with traditional 13th-century categories. Although, of course, in the following decades the notion of *minimum* will be at the centre of a significant number of doctrinal innovations at Oxford (and specifically at Merton College) in the limit-decision literature, within the larger framework of a fundamental season of original discussions on continuity and indivisibilism, this will not be true for the Aristotelian notion of hylomorphic *minima naturalia*. The most original developments in the Medieval Latin debate on *minima naturalia* during the first half of the 14th century are therefore fundamentally linked with the Parisian Faculty of Arts. To the debate taking place there at the beginning of the 14th century I now turn without further ado.

2.11.2. The State of the Debate at the Parisian Faculty of Arts ca. 1290-ca. 1310: The Debate concerning the Proper Operation of Substantial Forms

Among the Parisian *Physics* commentators of the Faculty of Arts active around the turn of the century, two stand out as particularly relevant (also for their role in the following chapters of the thesis). One is Radulphus Brito (ca. 1270-1320/21), a Parisian Master of Arts active from around 1290 until around 1305, who became *doctor theologiae* in 1312/13, and who contributed especially (but by no means exclusively) to Medieval logic and philosophy of language[566]. The second one is John of Jandun (ca. 1285-1328), the Parisian Master of Arts of the beginning of the 14th century whose name is largely connected to the history of the reception of Averroes' theories in the Latin West, especially that of the intellect.

By looking at these two masters' commentaries on *Physics* I.4 it is possible to see (although with some differences) the emergence of a debate that clearly involved also other masters at the Parisian Faculty of Arts during (at least) the period ca. 1290-ca. 1310

[566] For an introduction to Brito's life and works, see J.-L. DEUFFIC, "Un logicien renommé, proviseur de Sorbonne au XIVe s. Raoul le Breton de Ploudiry. Notes bio-bibliographiques", *Pecia. Le livre et l'écrit* 1, 2002, pp. 45-154, and also W.C. COURTENAY, "Radulphus Brito, master of Arts and Theology", *Cahiers de l'Institut du Moyen-Âge Grec et Latin* 76, 2005, pp. 131-158.

(I will provide evidence of this in Chapter 4). This debate is centred on the idea that a necessary condition for the existence of a substantial form is the ability to perform its proper operation. In Jandun's case (both in his *Physics* and in his *De sensu* commentaries) it is rather clear that this idea comes straight from an argument (already mentioned) employed by Averroes in his *Long Commentary* on the *Metaphysics* Θ. In Brito's case, there is no explicit evidence of this, neither in his *Physics* nor in his *De sensu* commentary. Nevertheless, it is very likely that the *auctoritas* of Averroes' *Long Commentary* on the *Metaphysics* played at least an indirect role even in Brito's case. Indeed, as I have already shown, the argument (which will be discussed at length by Jandun in his *De sensu* commentary), taken from Averroes' *Long Commentary* on *Metaphysics* Θ and aimed at refuting Islamic occasionalism, by claiming that if actions cannot be imputed to the subjects performing them (as the occasionalists say), then these subjects automatically lose their essences, so that one is forced to accept the absurd consequence that in the created world there are no distinct essences, had already been used by the Pseudo-Siger in his discussion of *minima naturalia* a few decades earlier. More than that, we know that the argument was also used, for instance, by Siger himself in his *De causis* commentary[567], so that it certainly enjoyed quite a wide circulation at the Parisian Faculty of Arts during the last decades of the 13th century. Be that as it may, both Brito and Jandun, although in different ways, seem to be committed to the original doctrine of "intrinsic" *minima naturalia* according to which, in homogeneous material substances, the minimal matter that a given substantial form can inform is the smallest one in which it has the power to perform its proper operation of acting on the outside environment so as to assimilate it to itself, and in which, therefore, the accidental forms of its primary qualities through which such a substantial form performs its proper operation also possess the power to act as instrumental causes of the substantial form itself. Below such threshold of smallness, the substantial form is immediately corrupted. Interestingly, both Brito and Jandun try to combine their doctrine of "intrinsic" *minima naturalia* with a doctrine of *minima secundum corruptionem*. Apparently, the way in which they combine the two views, in their respective *Physics* commentaries, is by claiming that the smallest quantity of matter in which a given substantial form is able to perform its proper operation is also the smallest one in which (again, through the action

[567] Cf. on this the literature quoted in Chapter 4, where the argument will be discussed in its own right.

of its primary qualities) it is capable of resisting to the corrupting action of the containing medium. If this is the correct interpretation of Brito's and Jandun's doctrine of *minima naturalia*, their doctrines of *minima sensibilia* become even more remarkable. Indeed, as I will show in Chapter 4, both Brito and Jandun structure their discussion on *minima sensibilia* in a way analogous to that in which they structure their discussion on *minima naturalia*. Nevertheless (and although with important differences), both seem to admit (this is clear from the text in Jandun's case, while it might remain no more than a possible solution in Brito's one) that the accidental forms of sensible qualities can exist in portions of matter so small that they do not have the power to perform their proper operation of acting on the external senses so as to engender a sensation. Nevertheless, as I will show in Chapter 4, in Jandun's case the solution to the issue of *minima sensibilia* is explicitly extended even to the case of *minima naturalia* (with the particularly significant example of the proper operation of the intellective soul as the substantial form of man). This shows that Jandun's position on the relation between the existence of a form and its ability to perform its proper operation presumably changed from his *Physics* to his *De sensu* commentary.

2.11.2.1. Radulphus Brito

Radulphus Brito was active at the Faculty of Arts around the period 1290-1305, so that his *Physics* commentary should be situated within this timeframe. Brito's *Physics* question commentary has never been edited, and it is extant in two manuscript witnesses[568]. Brito devotes two questions to the issue of *minima naturalia* in his commentary on *Physics* I.4, although in the first one he only touches upon it marginally. They are q. 18, *Utrum corpus finitum per resolutionem finiti ab eo consumitur*, and q. 19, *Utrum animalia sint determinata magnitudine et parvitate*[569]. In the first of the two *quaestiones*, Brito mostly focuses on the two different ways in which it is possible to

[568] They are the following ones: ms. Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. E.I.252 (14th century), ff. 1r-60r, and ms. Paris, Bibliothèque nationale de France, Lat. 16160 (14th century), ff. 3r-79v. For a list of quaestiones (exclusively based on the Paris manuscript) see ZIMMERMANN, *Verzeichnis Ungedruckter Kommentare zur* Metaphysik *und* Physik *des Aristoteles aus der Zeit von Etwa 1250-1350*, *op. cit.*, pp. 182-190. In what follows, all quotations are taken from the Parisian manuscript.

[569] The reference to *animalia* as the proper concern of the *quaestio* might appear at first surprising; yet, it is rather clear that the *quaestio* is not meant to address merely animals, or living beings more in general (as heterogeneous material substances), but also, and more prominently, homogeneous material substances.

divide the matter of a material substance intended as a continuous magnitude (i.e., in parts of the same proportion or of the same quantity; this distinction will be discussed in the next chapters, however, insofar as it features explicitly in the text of *De sensu* 6). Nevertheless, Brito already starts to note here that "a body is called 'continuous' insofar as it is considered not as a natural [entity, i.e., a material substance endowed with a substantial form], but as a continuous [entity, i.e., merely considering its matter][570]." That is to say, Brito starts his discussion by making use of the Philoponean-Averroistic dichotomy between a body *qua* continuous magnitude and a body *qua* material substance. Moreover, as he goes on to remark: "If, indeed, it is considered as a natural [entity, i.e., a material substance endowed with a substantial form], in this way it can be consumed by the separation [from it] of a finite portion [of matter] [...][571]." The reason for this is, however, only made clear in q. 19 of the commentary, where Brito starts by remarking that all material substances are such that, insofar as they are considered as material substances, they have a determined maximal and minimal quantity[572]. The argument he provides for the existence of "intrinsic" *minima naturalia* in (all) material substances is the following one:

> Those [entities] that have a determined operation so that insofar as they can perform it they are said 'animals' [the example is here specifically concerning them] and insofar as they cannot they are not said 'animals' if not equivocally, [those entities] have a determined quantity in greatness and in smallness. But all natural [entities] are of this kind; therefore etc. The minor [premiss] appears from *Metaphysics* IV, but the major [premiss] is proved, because those [entities] that have a proper operation have a determined power, which is the immediate principle of action (*immediatum principium agendi*). Indeed, assuming that the action proceeds from the form, this however is through a power, hence even fire does not act immediately through [its] substantial form, but through heat, as it is said in *De sensu et sensato* [cf. *De sensu et sensato*, 441b12-15][573]. But a determined power requires a

[570] RADULPHUS BRITO, *Quaestiones super Physicam*, Liber I, q. 18, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 10ra: "[...] corpus continuum dicitur prout consideratur non (*ms.* sed) in eo quod naturale, sed in eo quod continuum."
[571] RADULPHUS BRITO, *Quaestiones super Physicam*, Liber I, q. 18, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 10ra: "Si autem consideratur in eo quod naturale sic potest consumi per resecationem alicuius partis finite [...]."
[572] RADULPHUS BRITO, *Quaestiones super Physicam*, Liber I, q. 19, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 10rb: "Si autem considerantur in eo quod naturalia, tunc erit magnitudine et parvitate [...] determinata in quo erit dare tantum hominem quod eo non erit dare minus, et erit dare ita minimum quod non erit dare minorem, et hoc probatur ex talibus quantum ad presens."
[573] On the conceptual models of instrumental causality discussed in Medieval Latin commentaries on the *De sensu*, from the 13th and the early 14th century (with a specific focus on Jandun's case), cf. J.-B. BRENET, *Le feu agit-it en tant que feu? Causalité et synonymie dans les* Quaestiones *sur le* De sensu et sensato *de*

> determined magnitude. Indeed, it is said in *De caelo et mundo* Book I that power follows magnitude, so that in a greater magnitude there is a greater power, and a smaller one in a smaller [magnitude] [...]. Therefore those [entities] which have a determined operation will have in this way a determined magnitude; for this reason etc.[574].

It is not difficult to recognise in this passage a clear presentation of the doctrine that I have briefly outlined above. Note, first of all, that Brito clearly refers in the passage both to heterogeneous and homogeneous substances. Still, it is not immediately clear how to apply the model delineated to heterogeneous, animate, substances. Therefore, and given that the focus of the present thesis is only on the case of homogeneous material substances, I limit my interpretation exclusively to it. Insofar as the substantial form of homogeneous material substances has a proper operation (i.e., that of acting on its environment so as to assimilate it to itself), and insofar as the power to perform a given operation requires a certain quantity of matter, there is a minimal quantity of matter in which any substantial form will have the power to perform its proper operation. Moreover, insofar as an entity that does not have the power to perform its proper operation cannot be said to be essentially the same as the one which has the power to perform it, it can be inferred that a substantial form cannot exist in a quantity of matter smaller than the minimal one in which it has the power to perform its proper operation[575]. Significantly, Brito refers to heat (the accidental form of a primary quality) as the (immediate) power through which the substantial form of fire performs its proper

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Jean de Jandun, in GRELLARD, MOREL (eds.), *Les* Parva naturalia *d'Aristote. Fortune antique et médiévale*, *op. cit.*, pp. 163-195.

[574] RADULPHUS BRITO, *Quaestiones super Physicam*, Liber I, q. 19, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 10rb: "Illa qui habent determinatam operationem in quam cum possunt dicuntur animalia et in quam cum non possunt non dicuntur animalia nisi equivoce habent determinatam quantitatem in magnitudine et parvitate. Sed omnia naturalia sunt huiusmodi, ergo etc. Minor patet ex IV *Metaphysicorum*, sed declaratur maior, quia illa que habent propriam operationem habent determinatam virtutem, qui est immediatum principium agendi. Nam dato quod actio procedat a forma, hoc tamen est mediante virtute, unde et ignis immediate per formam substantialem non agit, sed mediante calore, ut dicitur *De sensu et sensato*. Sed virtus determinata magnitudinem requirit determinatam. Nam dicitur primo *Celi et mundi* quod virtus sequit magnitudinem ita quod in maiori magnitudine est maior virtus et in minori minor [...]. Ergo illa qui habent determinatam operationem habebunt ita determinatam magnitudinem; quare etc."

[575] Brito, it must be noted, at least in a later passage of the *determinatio* seems, however, to come close to a doctrine of *minima secundum formam*, a doctrine which, however, is not consistent with the rest of the determinatio. Cf. RADULPHUS BRITO, *Quaestiones super Physicam*, Liber I, q. 19, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 10va: "Item, ad determinatam causam sequitur effectus determinatus. Sed forma unica naturalis est causa determinata accidentis, ergo habebit accidentia determinata; talia autem sunt quantitas et qualitas, quia omnis substantia naturalis quantitatem determinatam habebit in magnitudine et parvitate. It might be that this passage simply shows the influence of Aquinas' position, presumably mediated by Peter of Auvergne (or by the Pseudo-Siger, whatever his identity), on Brito.

operation (i.e., that of acting on its environment so as to assimilate it to itself). Therefore, in the passage, the power that Brito defines as the *immediatum principium agendi*, in the case of fire, is the power of the accidental form of heat, rather than the power specific to the substantial form of fire[576]. Evidently, Brito is here relying on a doctrine of instrumental causality according to which, while the substantial form of homogeneous material substances is still the principal causal agent of the action of the substance itself, still such an action is performed through the mediation of the accidental forms of its primary qualities as instrumental causes (this is why Brito qualifies their power as the *immediatum principium agendi* of substantial forms themselves). As a result, what ultimately determines the existence of "intrinsic" *minima naturalia* in homogeneous material substances is not, primarily, the quantity of matter required for the power specific to the substantial form itself to be able to perform its proper operation, but rather the quantity of matter required for the power of the accidental forms of its primary qualities to be able to immediately act as an instrumental cause of the proper operation of substantial forms themselves. Interestingly, as I will show in Chapter 4, Brito, in his *De sensu* commentary, while discussing the issue of *minima sensibilia*, will explicitly admit that the accidental forms of sensible qualities can exist in nature (at least as a hypothesis) without the power to act, as non-instrumental causes, so as to perform their proper operation (i.e., that of engendering a sensation in the senses). Brito's position on *minima sensibilia* seems, therefore, to be in tension with his position on *minima naturalia* as articulated in his *Physics* commentary. Whether or not, in his *De sensu* commentary, Brito had changed his position on *minima naturalia* (as it is presumably the case for Jandun) remains, unfortunately, impossible to determine at the present state of research.

A fundamental additional element of Brito's doctrine of *minima naturalia* as presented in his *Physics* commentary is the insertion into this picture of the corrupting action of the containing medium. Indeed, according to Brito's view, below a certain threshold of smallness of the matter with which they are united the primary qualities of a homogeneous material substance lose the power to resist to the corrupting action exercised by the primary qualities of the containing medium, and therefore they (together

[576] Although it should always be clear that the power of the substantial form (that of fire, in this case), acts with the power of the accidental form inhering in it (the primary quality of heat, in this case) so as to produce a single action, insofar as the accidental form (the primary quality of heat, in this case) is acting as an instrumental cause to the subtantial form in which it inheres (that of fire, in this case).

with the substantial form of the substance in which they inhere) are immediately corrupted by the action of the containing medium. As Brito says in the following part of the *determinatio*:

> But the fact that [material substances] are determined in smallness is proved because that which makes things not so that they are corrupted, but so that they are preserved, [...] must give them a quantity and a power through which they can resist to their corrupting [media]. But nature makes things not so that they are corrupted, but rather so that [...] they are preserved, therefore it must give them a determined quantity and power so that they can resist to the corrupting [media], but this they cannot if [they exist] under a smaller quantity than the one that is minimal, therefore entities [i.e., material substances] could not have existed under a smaller quantity than the one that is minimal[577].

Brito's position is clear: every material substance (and, more specifically, its primary qualities) is endowed with the power required to resist to the corrupting action of the containing medium (and, more specifically, of its primary qualities). If primary qualities, through the progressive division of the matter to which they are united (intended as "physical" separation of part from part) lose such a power, then they are immediately corrupted by the containing medium, together with the substantial form of the homogeneous material substance in which they inhere[578]. Even concerning the way in which the process of corruption of a substance by the containing medium unfolds, to be precise, there are differences between Brito's presentation here and in the *De sensu* commentary. There, indeed, as I will show in Chapter 4, Brito seems to admit, at least as a hypothesis, that such a process of corruption might not be instantaneous (without detailing what his alternative conception would be, however), so that it might be that, at least for a very short span of time during the process of corruption itself, both the substantial form itself and all the accidental forms of the substance concerned exist without their respective powers.

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[577] RADULPHUS BRITO, *Quaestiones super Physicam*, Liber I, q. 19, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 10rb-va: "Sed quod sint determinata in parvitate probatur quia illud quod facit res non ut corrumpuntur sed ut salventur, [...] debet eis dare quantitatem et virtutem per quam possint suis corrumpentibus resistere. Sed natura facit res non |f. 10va| ut corrumpantur, sed magis ut [...] salventur, ergo determinatam quantitatem et virtutem <debet> eis (*ms*. est) dare et tantam ut possint corrumpentibus (*ms*. corruptibilibus) resistere, sed hoc non possunt si sub quantitate <minor> quam habetur minima, ergo entia sub quantitate <minor> quam habet<ur> minima non potu<er>unt esse; quare etc."

[578] The fact that Brito takes such a process of corruption to be instantaneous, while not being explicitly stated in the passage just quoted, is claimed by Brito in the last passage from his *Physics* commentary quoted below.

Even without adding this additional layer of complexity, however, as said above, some elements of tension between Brito's view as presented in his *Physics* commentary and the one he puts forth in his *De sensu* commentary remain. Indeed, after all, by admitting that, in isolation from the medium, so to speak, sensible qualities could exist without the power to perform their proper operation, in his *De sensu* commentary Brito is refusing to accept the existence of "intrinsic" *minima sensibilia*. On the contrary, in the *Physics* commentary, as seen, he remains fully committed to the idea that there are "intrinsic" *minima naturalia* in homogeneous material substances.

Two final considerations regarding Brito's doctrine of *minima naturalia* as presented in the *Physics* commentary are in order. Firstly, what are the sources of Brito's original doctrine of *minima naturalia*, a position that has no clear precedent in the *Physics* commentaries analysed in the chapter? It is certainly tempting to claim that a set of arguments coming from Averroes' *Long Commentary* on the *Metaphysics* influenced Brito in developing his position (one being that already used by the Pseudo-Siger, and the other ones being those that some masters use in their debate on *minima sensibilia*, as I will show in the following chapters of the thesis). Yet, Averroes is never quoted in this *quaestio*, and references to him are altogether absent also from Brito's discussion of *minima sensibilia* in his *De sensu* commentary, as I will show in Chapter 4. Instead, remarkably, although Brito was probably familiar with at least the most important Averroistic arguments quoted in this context, he constructs his position only by making reference to a set of three different Aristotelian passages, one from *Metaphysics* Book IV, one from the *De sensu* and one from *De caelo* Book I, showing that, in his mind, the position he is presenting is nothing more than the correct reading of Aristotle's thought in this respect.

Secondly, a final interesting aspect of Brito's doctrine of *minima naturalia* in his commentary on *Physics* I.4 that is important to underline in this context is that, although Brito does not make reference to the text of *De sensu* 6, still, in closing his *determinatio*, he inserts a clarificatory remark that seems to be explicitly taken from *De sensu* 6:

> It must moreover be understood that we can talk of the parts [of a material substance] according to [the fact] that they are in the whole or according to [the fact] that they are separate from the whole. If, however, we tak of the parts according to [the fact] that they are in the whole, [...] in this way there is no *minimum* in those parts [...]. If, however, we talk of the parts insofar as they are separated from the whole, in this

> way it appears that there is a minimal part, so that a smaller part could not preserve that natural form, but it would be immediately corrupted in the containing [medium][579].

Nowhere in the text of *Physics* I.4 does Aristotle distinguish between the parts of a material substance potentially existing in it and the parts coming to exist in act by being separated from it. This distinction, instead (a distinction that, remarkably, is also a central element of Scotus' discussion of *minima naturalia*, as seen above), features prominently in the discussion on *minima sensibilia* in *De sensu* 6, as I have briefly hinted at above and as it will become clearer in the next chapter. Brito's *Physics* commentary, therefore, provides support to the fact that, even at the end of the 13th century (or at the very beginning of the 14th) the discussion on *minima naturalia* in commentaries on *Physics* I.4 kept being conducted with a close eye to Aristotle's discussion on *minima sensibilia* in *De sensu* 6.

2.11.2.2. John of Jandun

John of Jandun discusses the issue of *minima naturalia* in q. 16 of his commentary on *Physics* I, *Utrum entia naturalia sint determinata ad maximum et minimum*. His position on *minima naturalia* as presented there is largely analogous to the one presented by Brito in his own *Physics* commentary, although motivated by a recourse to different *auctoritates*. First of all, Jandun claims, as Brito before him, that all material substances (although, as for Brito, I limit my consideration to the case of homogeneous ones) have *minima* (as well as *maxima*) *naturalia*, below which the substantial form of the substance itself cannot be preserved:

> To the question it must be said that natural entities are determined to the *maximum* and to the *minimum*, understanding it so that of any natural entity there is a certain quantity [which is] so small that under a smaller [quantity] its form cannot be preserved on its own and separated [from the whole to which it belongs]. Analogously, there is a quantity so great that under a greater [quantity] its form cannot be saved. For instance, there is some quantity of flesh so small that under a

[579] RADULPHUS BRITO, *Quaestiones super Physicam*, Liber I, q. 19, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 10va: "Est autem intelligendum quod nos possumus loqui de partibus secundum quod sunt in toto vel secundum quod sunt a toto separate. Si autem loquimur de partibus secundum quod sunt in toto, [...] sic non erit dare minimum in illis partibus (*ms.* qualitatibus) [...]. Si autem loquimur de partibus ut sunt a toto separate, sic constat dare minimam partem ita quod pars (*ms*. forma) minor illam formam naturalem salvare non posset, sed statim converteretur in continens."

> smaller one the form of flesh cannot exist separately. Analogously, there is some quantity so great that under a greater one the form of flesh cannot be preserved; analogously, moreover, it is [the same] for all the parts of natural entities, and for all those entities themselves[580].

The reason for Jandun's defense of the notion of "intrinsic" *minima naturalia* seems to be, as for Brito, his preoccupation with the notion of the *operatio naturalis* of each substantial form, and, in particular, with the idea that a substantial form must always be capable of performing its proper operation if it is to exist at all. This becomes clear in the following passage:

> [A]nd the reason of this [i.e., of the existence of "intrinsic" *minima* in material substances] is clear. Because those which are determined according to powers and natural qualities, are determined according to natural magnitudes. But every natural entity is determined according to natural power: because, etc. The major proposition [i.e., premiss] is evident: because a power follows a magnitude, so that in a greater magnitude there is a greater power, and a stronger one, and in a smaller magnitude a smaller one, all things equal; and this is especially true in simple bodies [i.e., elemental substances], of which it is more apparent that they are determined according to magnitude, so that in a greater fire there is a stronger heat and in a smaller one a weaker one, all things equal. And the minor [premiss] is clear, because any natural entity whatsoever has a determined operation. The operation, however, is determined by a determined power: because, etc. And the Commentator states this in the eighth Book of this [i.e., of his *Long Commentary* on the *Physics*] according to a comparison with artificial entities: indeed, all artificial entities require a determined quantity, without which they cannot perform their proper operation, such as an ax can be of such a small quantity that will not suffice to cut, and similarly it could be of such a great quantity that a man could not handle it in order to cut. Analogously, moreover, [it is the same] in the other [artificial entities] and so, moreover, it is in nature such as in art for what concerns this aspect[581].

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[580] IOANNES DE JANDUNO, *Quaestiones super libros Physicorum*, Liber I, q. 16, Venetiis, apud Hyeronimum Scotum, 1557, ff. XVIvb-XVIIra: "Ad questionem est dicendum quod entia naturalia sunt determinata ad maximum et ad minimum, sic intelligendo, quod cuiuslibet entis naturalis est aliqua quantitas ita parva quod sub minori non potest salvari forma illius seorsum et divisim. Similiter est ita magna quantitas quod sub maiori non potest salvari forma illius. Verbi gratia, est aliqua quantitas carnis ita parva que sub minori non potest existere forma carnis divisim. Similiter est aliqua quan|f. XVIIra|titas ita magna quod sub maiori non potest salvari forma carnis; similiter autem est de omnibus partibus entium naturalium, et de totis ipsis naturalibus."

[581] IOANNES DE JANDUNO, *Quaestiones super libros Physicorum*, Liber I, q. 16, Venetiis 1557, f. 17ra: "[e]t huius ratio est plana. Quia illa que sunt determinata secundum virtutes et qualitates naturales sunt deterinata secundum magnitudines naturales. Sed omne ens naturale est determinatu secundum virtutem naturalem : quare etc. Maior propositio est manifesta : quia virtus sequitur magnitudinem, ita quod in maiori magnitudine est maior virtus, et in minori minor, ceteris paribus: et precipue hoc verum est in simplicibus corporibus de quibus maius (*pro*: minus) videtur quod esset determinata secundum magnitudinem ut in maiori igne est fortior caliditas et in minori debilior ceteris paribus. Et minor patet quia quodlibet ens naturale habet operationem determinatam. Operatio autem determinata est a virtute determinata: quare etc. Et declarat Commentator hoc in octavo huius per simile in rebus artificialibus: quelibet enim res artificiales requirunt quantitatem determinatam sine qua non possunt in suam operationem propriam, ut securis possit esse ita parve quantitatis quod non sufficeret ad secandum. Et similiter posset esse tam magne quantitatis

Jandun's passage shows that the doctrine of "intrinsic" *minima naturalia* that Jandun advocates is basically the same presented by Brito (to the point that the text sometimes resembles Brito's wording in some of the passages quoted above). True, Jandun does not say explicitly that the power of the substantial form on which its existence depends is that of the accidental forms of its primary qualities, which (insofar as they act as instrumental causes) is the *immediatum principium agendi* of the substantial forms themselves of the substance in which the primary qualities inhere. Nevertheless, he does say that, on his model, the existence of the substantial form of fire is dependent on the existence of the accidental form of heat (and, more specifically, evidently, on the existence of the power of heat). Assuming, therefore, that for Jandun, as for Brito, any power in nature is proportional to the quantity of matter of the substance in which it inheres, the power of the accidental forms of primary qualities depends on the quantity of matter in which they exist, so that, below a certain threshold of smallness, such a power is lost. As a result, insofar as, when the accidental forms of its primary qualities have lost their power, a substantial form of a homogeneous material substance has lost the (instrumental) power to perform its proper operation (i.e., that of acting on its environment so as to assimilate it to itself), and insofar as a substantial form cannot exist without the power to perform its proper operation, the smallest quantity of matter in which such accidental forms possess their power becomes the (intrinsic) *minimum naturale* of the substantial form of the material substance at hand.

What truly distinguishes Jandun's passage from Brito's corresponding one(s) is the fact that Jandun does not refer directly to any Aristotelian *auctoritas*; rather, he deems preferable to refer to an argument taken from Averroes' *Long Commentary* on *Physics* VIII. The reference to Averroes, as it will be shown in Chapter 4, is also at the centre of Jandun's discussion of *minima sensibilia*. There, Jandun will quote the Averroistic passage which, presumably, influenced him the most, i.e., the argument from Averroes' *Long Commentary* on *Metaphysics* Θ already used, as seen, by the Pseudo-Siger in his discussion of *minima naturalia*. Both arguments referred to by Jandun, however, go in the same direction, i.e., that of claiming that the possession of the power to perform its proper operation is a necessary condition for a form (be it substantial or accidental) to

quod homo non posset eam movere ad secandum. Similiter autem et in aliis, sic autem est in natura sicut in arte quo ad hoc."

exist within a given hylomorphic compound. It is all the more interesting and relevant, then, that, as I will show in Chapter 4, Jandun (such as Brito, although in a different way) will deny the validity of this exact same principle in connection with the accidental forms of sensible qualities. As I have already said above, however, while Brito does not refer back to the issue of *minima naturalia* in his *De sensu* commentary, Jandun seems, in his own *De sensu* commentary, to propose a model where the validity of this principle is not required anymore not only for the existence of the accidental forms of sensible qualities, but also, correspondingly, for the existence of substantial forms (or at least for the existence of the substantial forms of heterogeneous material substances).

When it comes, then, to the discussion of the role of the corrupting action of the containing medium, in his *Physics* commentary Jandun takes, again, Brito's same line. Also for him, indeed, the minimal quantity of matter in which the accidental forms of primary qualities possess their power is also the minimal quantity in which they are able to resist to the corrupting action of the containing medium, so that, once such power is lost, the accidental forms, together with the substantial form of the substance in which they inhere, are immediately corrupted.

A final element of Jandun's discussion of *minima naturalia* in his *Physics* commentary is that, differently from Brito, Jandun shows to be keenly aware of Boethius of Dacia's (and of John Duns Scotus') criticism of the notion of *minima secundum formam*, specifically to the argument, most prominently discussed by Boethius of Dacia, according to which the corruption of a material substance can never be caused by division alone, something which follows from the acceptance of the doctrine of *minima secundum formam*. Jandun, indeed, claims that division is never the *primary* cause of the corruption of a material substance. Division, Jandun maintains, is merely an *instrumental* cause of the corruption of a (homogeneous) material substance. Indeed, insofar as (homogeneous) material substances always exist in a containing medium, division acts instrumentally so as to support the corrupting action of the containing medium. More in particular, thanks to the action of division, below a certain threshold of smallness (which, as Jandun explicitly states, can vary for different substances[582]), the matter of a given (homogeneous) material substance becomes so small that the accidental forms of its

[582] Cf. IOANNES DE JANDUNO, *Quaestiones super libros Physicorum*, Liber I, q. 16, Venetiis 1557, f. 17rb: "[…] minimum terre est minoris quantitatis minimo aeris."

primary qualities are of such a small power (*virtus*) so as to be incapable to resist to the corrupting action of the containing medium. As a consequence, such a portion of a (homogeneous) material substance acquires the substantial form of the containing medium:

> It must be considered that, even though natural entities subsisting by themselves and on their own or divided [from the whole to which they belong] are determined to the *minimum*, still, for what concerns the extremely small parts existing in the whole which cannot participate in the natural form [of the whole] by themselves and separated, in this way they are not determined to the *minimum* without qualification: on the contrary, given any part of flesh whatsoever, still there is a smaller one which exists in the whole of flesh; not, however, any of them can participate to the nature of flesh by itself and separated [from the whole]: on the contrary, if [these parts] were separated, they would be resolved in the containing [medium], such as an extremely small [drop of] flavour poured into the water of the sea, such as Aristotle teaches in the book *De sensu et sensato* [cf. *De sensu* 6, 446a8-9]. […] But some [commentators, such as Boethius of Dacia] wonder what will generate in this way the substantial form; for instance, if the *minimum* of lead is divided, what will give to those parts the form of air. And it must be said that the dividing agent [acts] instrumentally (*instrumentaliter*): and the power (*virtus*) of the heaven that exists in the containing [medium] will give such substantial form or the very same containing [medium] through its substantial form will generate a form similar to itself in the matter of different particles[583].

As it appears, therefore, Jandun's discussion of the process of corruption of a (homogeneous) material substance by the containing medium involves two "stages" of instrumental causality, so to speak. Indeed, the dividing agent that "physically" divides the (homogeneous) substance concerned in smaller and smaller portions, until the accidental forms of primary qualities in such portions lose the power to resist to the corrupting action of the containing medium, acts as a first instrumental cause that allows the primary qualities of the corrupting medium, acting as a second instrumental cause, to

[583] IOANNES DE JANDUNO, *Quaestiones super libros Physicorum*, Liber I, q. 16, Venetiis 1557, f. 17ra-b: "Considerandum est quod, licet naturalia per se subsistentia et seorsum sive divisim sint determinata ad minimum, tamen quantum ad partes in toto existentes excellentis parvitatis non potentes participare seorsum et divisim formam naturalem, sic non sunt determinata ad minimum simpliciter : immo quacumque parte carnis data adhuc est minor existens in tota carne ; non tamen quelibet talium potest participare seorsum et divisim naturam carnis : immo si separarentur resolverentur in |f. XVIIrb| continens, ut minimus sapor infusus aque maris, ut docet Aristoteles in libro *De sensu et sensato*. […] Sed aliqui mirantur quid generabit huiusmodi formam substantialem. Verbi gratia, si minimum plumbum dividatur quid dabit illis partibus formam aeris. Et est dicendum quod ipsum dividens <agit> instrumentaliter: et virtus celi existens in continente dabit talem formam substantialem vel ipsummet continens per suam formam generabit sibi similem formam in materia particularum diversarum."

dispose the matter of such portions of a homogenous material substance to receive the substantial form of the medium itself together with its inhering accidental forms.

This passage, therefore, represents a fundamental witness to the reception in the early 14th century of a line of discussion of *minima naturalia*, and specifically of *minima secundum formam*, going back to Boethius of Dacia and to John Duns Scotus. Moreover, the passage is also significant in the fact that, as in Brito's corresponding one, Jandun makes an (explicit, differently from Brito) appeal to the *auctoritas* of *De sensu* 6 in order to ground the discussion of the corrupting action of the containing medium on extremely small portions of (homogeneous) material substances. Moreover, in the passage, as in Brito's corresponding one, the role of *De sensu* 6 is also evident in the distinction made by Jandun between the portions of a (homogeneous) material substance existing potentially within the whole to which they belong and those coming to exist in act by being "physically" separated from it. Nevertheless, as I will show in Chapter 4, Jandun's discussion of *minima sensibilia* in his *De sensu* commentary will mostly leave aside the corrupting action of the containing medium and it will focus on the notion of "intrinsic" *minima sensibilia*. Along the way, not only will Jandun arrive to develop an original and importantly innovative doctrine of *minima sensibilia*, but, as said, he will also significantly modify the doctrine of "intrinsic" *minima naturalia* presented in his *Physics* commentary.

2.11.3. The Medieval Latin Debate on *Minima naturalia* between the End of the 13th Century and the Beginning of the 14th Century: A Summary

The years around which Scotus developed his own position on *minima naturalia* are the same in which some important *Physics* commentators, both at Oxford and Paris, dealt with the same issue.

At Oxford, the most important discussion (presumably dating to the last years of the 13th century) is the one by Thomas Wylton in his unedited *Physics* commentary. Wylton, remarkably, after formulating the issue of *minima naturalia* according to the Philoponean-Averroistic dichotomy, adopts in very clear terms a doctrine of *minima naturalia secundum formam* that seems to be indebted to the strong influence of Averroes' *Long Commentary* on the *Physics*. True, the text, and Averroes' authority more generally,

is not quoted by Wylton specifically in support of his doctrine *minima naturalia*, but its strong presence in the quaestio and in the commentary more generally leaves little doubts in this respect. Importantly, in articulating his view Wylton makes explicit reference to the preserving power of substantial forms, an aspect that featured in the Pseudo-Siger's *Physics* commentary and that, as I will show in the next chapter, will also feature in Aquinas' *De sensu* commentary. Wylton's position, therefore, clearly points to the persistence of the view of *minima secundum formam* in the Oxford *Physics* commentary tradition even at the turn of the century.

The Parisian debate on *minima naturalia* around the same time appears, instead, to be interested by a significant development, that is witnessed both by Radulphus Brito's *Physics* commentary and by John of Jandun's one. The main point of this debate consists in linking the issue of the minimal quantity of matter of a homogeneous material substance in which its substantial forms can exist with that of the minimal quantity of matter in which such a substantial form has the power to perform its proper operation, taken to be that of acting on its environment so as to assimilate it to itself. According to these commentators, thus, in homogeneous material substances there are "intrinsic" *minima naturalia* that correspond to the minimal quantity of matter in which the substantial form of such substances has the power to perform its proper operation. Remarkably, given that the substantial form of homogeneous material substances performs its proper operation through the action of the accidental forms of its primary qualities, *minima naturalia* coincide with the minimal quantity of matter in which such accidental forms (that Brito qualifies as the immediatum principium agenda of substantial forms) have the power to act as instrumental causes to the action of their corresponding substantial forms.

Below this minimal quantity of matter, according to both Brito and Jandun, the substantial form of homogeneous material substances (together with its accidental forms) is immediately corrupted by the corrupting action of the containing medium. In this respect, both commentators appear to think that the minimal quantity in which the substantial form of homogeneous material substances has the power to perform (through the accidental forms of its primary qualities) its proper operation is also the minimal quantity in which such substantial form (again, through the accidental forms of its primary qualities) has the power to resist to the corrupting action of the containing medium (in its

own turn exerted through the action of the accidental forms of its own primary qualities). Jandun also adds (presumably in reply to Boethius of Dacia's argument according to which division can never be the cause of the corruption of a material substance) that, in the process of corruption of extremely small parts of portions of homogeneous material substances separated from the whole to which they belong, division acts as a (further) instrumental cause to the corrupting action exerted by the substantial form of the medium through the accidental forms of its primary qualities.

Importantly, both Brito's and Jandun's doctrine of *minima naturalia* as presented in their respective *Physics* commentaries seems to be in tension with the doctrine of *minima sensibilia* they will present in their respective *De sensu* commentaries. There, as I will show in Chapter 4, both commentators will claim (although with important differences) that the accidental forms of sensible qualities can, in principle (for Jandun certainly also in the actual world) exist in extremely small portions of matter without the power to perform their proper operation, i.e., that of acting on the external senses so as to engender a sensation. Jandun seems even to extend this "new" doctrine also to substantial forms, at least to those of heterogeneous material substances.

Regardless of this apparent tension, on which I will discuss more extensively in Chapter 4, it bears underlining that Brito and Jandun, both in their *Physics* and *De sensu* commentaries, appear to be fully inserted in a debate going on at the Parisian Faculty of Arts between the end of the 13th century and the beginning of the 14th century and concerning, specifically, the possibility for forms to exist in act without the power to perform their proper operation.

2.12. Changing Understandings of *Minima naturalia* in the New Intellectual Landscape of Paris in the "Mature" 14th Century

Turning to mature 14th-century Parisian commentators, the debate on *minima naturalia* changes significantly, given that, since the first decades of the 14th century, at least three new issues enter the picture at the Parisian Faculty of Arts.

The first and most importante one is the belief, contrary to the traditional view of previous commentators, that the process of corruption of parts of a material substance smaller than their *minimum naturale* is a process taking place through an extended

interval of time, rather than instantaneously. This conceptual shift, especially in early 14th-century commentaries on *Physics* I.4, seems to be based on the adoption of temporally extended conceptions of the process of substantial change, intended as the corruption of an individual substance and the generation of another one[584]. Although the two issues are clearly different, indeed, in the early 14th century the debate on *minima naturalia* seems to have acted as an important "laboratory" that, in some cases, allowed commentators to develop and to test conceptions of the process of generation and of corruption of material substances as individual wholes. The view of substantial change (and, correlatively, of the corruption of extremely small portions of material substances separated from the whole to which they belong) as a temporally extended process is based on two alternative conceptions, that, nevertheless, as I will show below, are probably not entirely independent from each other (inasmuch as the first one of them might have played an influence on the development of the second one).

The first one is Walter Burley's view that corruption is the inclusive limit, i.e., the last instant, of a process of alteration, insofas as accidents alone can generate a new substance, a thesis famously associated with Burley's *Tractatus primus*[585], a work datable around 1319/1320 and 1323[586], but strongly present also in Burley's last commentary on *Physics* I.4, which is very likely a later work. According to such a thesis, although substantial change itself precisely conceived does not have a temporally extended structure, since it is instantaneous, the temporally extended structure of alteration becomes part of the process of corruption broadly conceived. The second conception grounding a temporally extended view of substantial change in early 14th-century *Physics* commentaries is what

[584] There are, to be sure, also 13th-century Aristotelian commentators who adopted a temporally extended view of substantial change. One case in point is Roger Bacon, who, especially in his *Communia naturalium*, understood substantial change as a temporally extended process. The reasons that led him to hold such a theory, however, were mostly linked to his acceptance of the idea that substantial forms have intensive degrees comparable to those of accidental forms. His view, therefore, is fundamentally different from all those of the 14th-century thinkers that will be discussed in this thesis. On Bacon's original conception of the temporal structure of substantial change, see C. TRIFOGLI, *Roger Bacon on Substantial Change*, in N. POLLONI, Y. KEDAR (eds.), *The Philosophy and Science of Roger Bacon. Studies in Honour of Jeremiah Hackett*, London-New York, NY, Routledge, 2021, 54-75.

[585] Cf. L.M. DE RIJK, "Burley's So-called *Tractatus Primus*, with an Edition of the Additional *Quaestio Utrum contradictio sit maxima oppositio*" *Vivarium* 34 (2), 1996, pp. 161-91, p. 168: "Prima [i.e., *conclusio*] quod qualitas in virtute propria potest producere formam substantialem vel in virtute propria esse principium totale productivum forme substantialis."

[586] Concerning the dating of the *Tractatus primus*, see M. VITTORINI, "Life and Works", in A.D. CONTI (ed.), *A Companion to Walter Burley. Late Medieval Logician and Metaphysician (Brill's Companions to the Christian Tradition 41)*, Leiden-Boston, MA, Brill, 2013, pp. 17-48, p. 47.

I call the "piecemeal" view of substantial change, that is, a view according to which, insofar as all the substantial forms of inanimate homogeneous substances (and, for that matter, also the vegetative and sensitive soul) possess quantitative parts co-located with the quantitative parts of matter informed by them, the substantial change of any tridimensionally-extended portion of a homogeneous material substance (as well as of living beings apart from man) takes place 'part after part' over an extended interval of time (hence the name of the view). In this perspective, differently from Burley's one, the temporally extended structure of substantial change depends on the continuous structure of the portions of matter (and of substantial forms) undergoing substantial change. It is very difficult, at the present state of research, to trace the origins of this idea, and this is an enquiry that lies outside the scope of the present thesis[587]. Nevertheless, what is certain is that such a view features prominently in John Buridan's, Nicole Oresme's and Albert of Saxony's commentaries on *Physics* I.4. Indeed, both Burley's view and Buridan's, Oresme's and Albert of Saxony's ones are put to use in connection with the issue of

[587] It is generally known that William of Ockham adhered to the claim that substantial forms (apart from the intellective soul) have integral (quantitative) parts, presumably considered as co-located with the parts of matter informed by them. On this aspect, see especially C.G. NORMORE, "Ockham's Metaphysics of Parts", *The Journal of Philosophy* CIII (12), 2006, pp. 737-754. On the influence of Ockham's thought in Paris during the central decades of the first half of the 14th century, see especially W.J. COURTENAY, *Ockham and Ockhamism. Studies in the Dissemination and Impact of His Though (Studien und Texte sur Geistesgeschichte des Mittelalters 99)*, Leiden, Brill, 2008. Many important considerations in this respect can also be found in Zénon Kaluza's various works on the subject (cf. for instance, with a special attention to the distinction between Ockham and the early Parisian "Ockhamism", and also between the latter and Buridan's thought, Z. KALUZA, *Les sciences et leurs langages. Note sur le statut du 29 décembre 1340 et le prétendu statu perdu contre Ockham*, in L. BIANCHI (ed.), *Filosofia e teologia nel trecento. Studi in ricordo di Eugenio Randi (Textes et Études du Moyen Âge 1)*, Turnhout, Brepols, 1994, pp. 197-258). Significantly, however, as has already partly been detailed, and as it will be clarified in what follows, Ockham himself never drew the implications of his innovative conception of the mereology of substantial forms in connection with the issue of *minima naturalia*, which he always discussed in a rather traditional fashion. More in general, at the present state of research, it is even difficult to claim that Ockham derived from this belief a temporally extended conception of substantial change, and, more specifically, a "piecemeal" one; he rather seems to adhere to an instantaneous view of it (cf., for instance, GUILLELMUS DE OCKHAM, *Quaestiones in libros Physicorum Aristotelis*, q. 100, in GUILLELMUS DE OCKHAM, *Brevis summa libri Physicorum, Summula philosophie naturalis et Quaestiones in libros Physicorum Aristotelis (Opera Philosophica VI)*, ed. S. BROWN, St. Bonaventure, NY, Franciscan Institute of St. Bonaventure University, 1984, p. 664, ll. 20-22: "Secunda distinctio est quod eorum permanentium quae subito generantur quaedam sunt quorum generatio mensuratur aliquo instanti determinato, sicut ignis, homo et huiusmodi"). Another source that could have influenced Buridan and Oresme in their new views of the mereology of substantial forms, and also, more directly, in their acceptance of the "piecemeal" view of substantial change, is Francis of Marchia (who also believed in the idea that substantial forms have quantitative parts). I owe this suggestion to Aurélien Robert. Unfortunately, this is an aspect of Marchia's natural philosophy than (differently from many others) has not yet the subject of close scrutiny, so that I cannot draw any conclusion in this respect here. Recall, however, that, as seen above, also Scotus, in his initial presentation of the issue of *minima naturalia*, appears to refer (although in a rather obscure way) to an "innovative" doctrine that takes substantial forms to have quantitative parts of their own.

minima naturalia (and, for Albert of Saxony, of *minima materia*) in a largely analogous way. In both cases, the fact that the process of corruption of portions of homogeneous material substances smaller than their *minimum naturale* has a temporally extended structure has the consequence that the very notion of *minima secundum corruptionem* loses its value as an "absolute" notion of *minima naturalia*. First of all, indeed, the duration of the process of corruption of extremely small portions of such substances by the containing medium depends on the relative strength of the power of the medium and of the substance undergoing corruption. Secondly, and more to the point, even for a corruption taking place through an extremely small interval of time it is still possible to claim that any portion of homogeneous material substances being corrupted through it is still (potentially) infinitely divisible through the (potential) infinite divisibility of the time through which it is corrupted.

The second innovative aspect of 14th-century debates on *minima naturalia* is an increasing "mathematisation", so to speak, of the analysis of the interaction of such *minima naturalia* (or, more precisely, of material substances above and below them) with their environment. Indeed (and in connection with the first innovative aspect just explained), the very idea of the interaction between the active (and corrupting) power of the containing medium and the passive one of the contained substance, central to 13th-century debates on *minima secundum corruptionem*, starts to be understood in terms of a *numerical* proportion (between *the parts* of the medium and *the parts* of a substance, crucially), albeit in rudimentary ways. This aspect, of course, is by no means an idyosincracy of discussions on *minima naturalia*, rather, it represents a good (and not frequently mentioned in secondary literature) example of a more general tendency towards the mathematical analysis of natural processes which has been well documented in recent years, and that, therefore, there is no reason to discuss further in this context[588].

[588] For an important discussion of this issue, with a specific focus on the Parisian Faculty of Arts between 1340 and 1350 (but considered as a pivotal period to understand the developments of the new mathematical tools applied to natural philosophy by Buridan and the masters most closely related to him), see F. ZANIN, *L'analisi matematica del movimento e i limiti della fisica tardo-medievale. La ricezione della* perspectiva *e delle* calculationes *alla Facoltà delle Arti di Parigi (1340-1350) (Subsidia Mediaevalia Patavina 6)*, Padova, Il Poligrafo, 2004. Still useful are also John Murdoch's classical studies on the issue, such as J.E. MURDOCH, Mathesis in Philosophiam Scholasticam Introducta*: The Rise and Development of the Application of Mathematics in Fourteenth Century Philosophy and Theology*, in *Arts libéraux et philosophie au moyen âge. Actes du IV Congrès International de Philosophie Médiévale*, Montréal-Paris, Institut d'Études Médiévales-Vrin, 1969, pp. 225-254, but also the earlier J.E. MURDOCH, Rationes Mathematice*: Un aspect du rapport des mathématiques et de la philosophie au Moyen Âge*, Paris, Conférence donnée au Palais de la Découverte, 1962. For a more general perspective over the relation

The third aspect is the explicit reference to the possibility that the conclusions achieved regarding *minima naturalia* when considering the ordinary course of nature could change if one were to take into consideration God's direct action *de potentia absoluta*, that is, outside of the ordinary course of nature (where God acts *de potentia ordinata*). Nevertheless, the *potentia absoluta* is normally appealed to, in discussions of *minima naturalia* – and, as I will show in Chapter 4, also *sensibilia* – merely in order to add examples and considerations relevant to a discussion exclusively conducted according to the ordinary course of nature. As a rseult, this third aspect does not add any substantial element to the debate, and, as such, it will be mostly disregarded in what follows[589].

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between mathematics and natural science in the Latin Middle Ages, see, among many others, the essays contained in E. GRANT, J.E. MURDOCH (eds.), *Mathematics and Its Applications to Science and Natural Philosophy in the Middle Ages*, Cambridge, Cambridge University Press, 1987. A more specific analysis regarding the role of mathematics in Oresme's natural philosophy (in strict connection with Oresme's theory of *modi rerum*) can be found in J. CELEYRETTE, "Le statut des mathématiques dans la *Physique* d'Oresme", *Oriens-Occidens. Sciences, Mathématiques et Philosophie de l'Antiquité à l'Âge Classique* 3, 2000, pp. 91-113.

[589] Moreover, this latter aspect – but not the former two - had been anticipated in some late 13th-century discussions of *minima naturalia*, such as the one by Richard of Middleton, as shown above. Nevertheless, what is important to underline here is that the possibility to apply the distinction between God's absolute and ordered power (a very traditional distinction in Scholastic theology, one going back to the 12th century) presupposes a fundamental conceptual shift in its meaning. Indeed, the traditional Scholastic understanding of the distinction, one largely shared until John Duns Scotus, is an understanding according to which the distinction has a mere logical value. In this perspective, God's absolute power exclusively refers to the fact that, at Creation, God could have chosen among all possible worlds, that is, all the conceivable (non-contradictory) ones. In this sense, God's ordered power refers to the world actually chosen by God. According to Scotus' understanding, instead, God's absolute power refers to the fact that God has the possibility to act in the created world, at any time whatsoever, without abiding by the laws He established according to His ordered power (therefore undoing what He had done). Scotus' famous analogy, in this respect, is that of God as a sort of 'absolute monarch' who is not forced to obey the laws He himself has established. Scotus' innovative, "operational" conception of the distinction between God's absolute and ordered power was to have an immense influence on 14th century theology and philosophy. In the field of natural philosophy, especially, this innovative conception could be put to use (and it has, indeed, been put to use) in order to discuss cases that violate the ordinary course of nature but that could nevertheless become reality by God's absolute power. For the recognition of the role played by Scotus in devising an innovative conception of the distinction, the fundamental reference point remain the studies by Eugenio Randi, especially E. RANDI, *A Scotist Way of Distinguishing between God's Absolute and Ordained Power*, in A. HUDSON, M. WILKS (eds.), *From Ockham to Wyclif. Proceedings of the Colloquium of Oxford*, April 1985, Oxford, Blackwell, 1987, pp. 43-50, and ID., Lex est in potestate agentis. *Note per una storia della idea scotista di* potentia absoluta, in M.T. FUMAGALLI BEONIO BROCCHIERI (ed.), *Sopra la volta del mondo. Onnipotenza e potenza assoluta di Dio tra medioevo e età moderna (Quodlibet 1)*, Bergamo, Lubrina, 1986, pp. 129-138. More generally, other fundamental works by Randi, that situate Scotus' innovation within the more general context of the history of the distinction between God's absolute and ordered power are E. RANDI, *Il sovrano e l'orologiaio: due immagini di Dio nel dibattito sulla* potentia absoluta *fra XIII e XIV secolo*, Firenze, La Nuova Italia, 1987 (where Randi introduces the distinction between the "logical" and the "operational" conceptual model of God's absolute power), ID., "Onnipotenza divina e futuri contingenti nel XIV secolo", *Documenti e studi sulla tradizione filosofica medievale* I, 1990, pp. 605-630, and ID., *Plurality of Worlds: Fourteenth-Century Theological Debates*, in S. KNUUTTILA, R. TYÖRINOJA, S. EBBESEN (eds.), *Knowledge and the Sciences in Medieval Philosophy. Proceedings of the Eighth*

This said, it must be borne in mind that with Walter Burley, and with Buridan and his closest interlocutors, as well as with other mature 14th-century commentators (mostly Parisian ones) on the *Physics*, the theoretical categories referred to up to now do not have to be abandoned in favour of completely different ones. *Minima secundum corruptionem*, in particular, continue to provide the main conceptual framework to the treatment of the issue of *minima naturalia*, albeit read through the new theoretical aspects just mentioned.

2.12.1. Walter Burley: Alteration, Corruption and *Minima secundum corruptionem*

These innovative aspects can be seen in their developing phase in Walter Burley's last *Expositio* of the *Physics*[590]. Walter Burley (ca. 1275-1344), Master of Arts at Merton College in Oxford by 1301, and Master of Theology in Paris by 1324, wrote at least three different commentaries on the *Physics*, but, for the purposes of this thesis, I will only look at his most mature work, the *Expositio in octo libros de Physico auditu* written after 1324 but, to some extent, incorporating also preceding materials[591].

International Congress of Medieval Philosophy (SIEPM) (Vol. II), Helsinki, Sagwan Press, 1990, pp. 322-330. For a more general perspective on the distinction between God's absolute and ordered power in the Medieval Latin theological (and philosophical) debate, see W.J. COURTENAY, Potentia absoluta/ordinata, in *Historisches Wörterbuch der Philosophie, Bd. 7*, Basel, Schwabe, 1989, pp. 1157-1162, ID., *Capacity and Volition: A History of the Distinction of Absolute and Ordained Power*, Bergamo, Lubrina, 1990, F. OAKLEY, *Omnipotence, Covenant, and Order: An Excursion in the History of Ideas from Abelard to Leibniz*, Itahca, NY, Cornell University Press, 1984, and M.A. PERNOUD, "The Theory of the *Potentia Dei* according to Aquinas, Scotus and Ockham", *Antonianum* XLVII (1), 1972, pp. 69-95. For a history of the uses of the concept of God's absolute power in relation with natural philosophy, from the Parisian condementation of 1277 onwards, the fundamental reference point remains E. GRANT, "The Condemnation of 1277, God's Absolute Power, and Physical Thought in the Late Middle Ages", *Viator* 10, 1979, pp. 211-244. On Burley's use of the notion of God's absolute power (and of the distinction between God's absolute and ordered power) in relation with his discussion of continuity (although in the specific context of his polemics with Ockham), see also A. LAMY, "Les arguments *de potentia divina* sur la structure du continu dans l'œuvre de Walter Burley", *Antonianum* LXXXV (1), 2010, pp. 81-96. On the use of the notion of God's absolute power in Buridan's thought, see J. BIARD, *Science et nature. La théorie buridanienne du savoir (Études de philosophie médiévale XCIX)*, Paris, Vrin, 2011, and also M.E. REINA, *L'ipotesi del* casus supernaturaliter possibilis *in Giovanni Buridano*, in *La filosofia della natura nel Medioevo. Atti del terzo congresso internazionale di filosofia medievale. Passo della Mendola (Trento) 31 agosto-5 settembre 1964*, Milano, Vita e Pensiero, 1966, pp. 683-690, republished in L. COVA, S. NAGEL (eds.), Res et signa. *Studi di Maria Elena Reina (Millennio Medievale 86. Strumenti e Studi 26)*, Firenze, SISMEL-Edizioni del Galluzzo, 2010, pp. 289-295.

[590] It should be remarked from the outset that, in this as in many other respects, Burley is closer to the Parisian intellectual tradition of the early 14th century than to the contemporary Oxford one.

[591] On the complex textual history of Burley's *Physics* commentaries, see R. WOOD, "Walter Burley's *Physics* Commentaries", *Franciscan Studies* 44, 1984, pp. 275-327. The last *Physics* commentary survives in at least 23 manuscripts, attesting to his enduring influence throughout the 14th century and also later on. The work was also "printed three times between 1482 and 1501" (WOOD, "Walter Burley's *Physics* Commentaries", *op. cit*., p. 275). The edition used here is the *editio princeps*, GUALTERUS BURLAEUS, *In octo libros de Physico auditu*, Venetiis, 1482. For the evolution of Burley's views throughout his different

Now, Burley's *Expositio* of *Physics* I.4 presents an extremely interesting discussion of *minima naturalia*, one which shows all the hesitations of the commentator in adjudicating between a traditional view assuming the existence of "intrinsic" *minima naturalia*, or at least *secundum corruptionem*, and a more skeptical view derived on the one hand from the metaphysical arguments going back at least to Boethius of Dacia and Scotus and, on the other hand, from the new understanding of substantial change (at least for homogeneous material substances) as being a temporally extended process, together with a tentative numerical analysis of the ability of material substances to resist to the containing medium.

Burley starts his discussion by assuming that in homogeneous material substances the existence of *minima naturalia* must be accepted, at least for what concerns the *actual* existence of portions of such substances as separated from the whole to which they belong, and not for *potential* parts within the whole[592]. This model appears to be the one traditionally associated with *De sensu* 6, which, ultimately, came to be explicitly connected with the notion of *minima secundum corruptionem* as discussed above. Indeed, Burley claims that the existence of *minima naturalia* in a process of progressive separation of parts from the whole of a homogeneous material substance depends on the fact that smaller parts are not able to resist to the corrupting action of the containing medium. The existence of *minima naturalia* in homogeneous material substances is supported, by Burley, with an appeal to a group of *auctoritates*. Apart from the text of *Physics* I.4, the ones quoted are *De sensu* 6 (which, therefore, appears to play, again, a central role in the debate on *minima naturalia*), Averroes' *Long Commentary on Physics* I.4 and Averroes' *Long Commentary* on *Physics* VII (one of the main passages, as illustrated above in the chapter, where Averroes presents his theory of *minima naturalia*, primarily concerning motion and, together with it, also magnitudes)[593].

Physics commentaries, and more in general on some general features of his approach to commenting the *Physics*, see E.D. SYLLA, "Walter Burley's Practice as a Commentator on Aristotle's *Physics*", *Medioevo. Rivista di storia della filosofia medievale* XXVII, 2002, pp. 301-371, EAD., "Walter Burley's *Physics* Commentaries and the Mathematics of Alteration", *Early Science and Medicine* 6 (3), 2001, pp. 149-184, and, more recently, A. LAMY, "Le lieu selon Walter Burley", *Franciscan Studies* 68, 2010, pp. 137-158.

[592] GUALTERUS BURLAEUS, *Expositio in octo libros de Physico auditu*, Venetiis 1482, f. 20ra: "Igitur breviter est dicendum quod in homogeneis est dare minimum naturale per se existens, non tamen est dare minimum inexistens, et quod non sit dare minimum inexistens in homogeneis probatur ratio dubitationis inducte, quod in homogeneis sit dare minimum per se existens."

[593] GUALTERUS BURLAEUS, *Expositio in octo libros de Physico auditu*, Venetiis 1482, f. 20ra: "Hoc accipitiur a philosopho hic quod point carnem minimam, et etiam accipitur ex libro *De sensu et sensato* et est expressa intentio Commentatoris commento tertio huius, ubi dicit quod minimum de omni generato est

At this point, however, Burley considers it important to consider the criticisims raised against the notion of *minima secundum corruptionem* by Boethius of Dacia and by Scotus. Even though Burley does not refer to specific commentators at this point, he does clearly mention the main line of criticism adopted by both Boethius and Scotus, namely, the fact that the notion of *minima secundum corruptionem* makes the existence of *minima* entirely dependent on an extrinsic cause, one which, therefore, is fully compatible with the idea that there is no intrinsic cause for the existence of *minima*:

> But here it must be posited a *dubium*: whether this [i.e., the existence of *minima naturalia*] depends on the intrinsic nature of the thing, such that a *minimum* must be posited because of this, i.e., that it is incompatible with the nature of the form of such a species to be found in a smaller matter by itself, so that the limit in smallness depends from the same specific form, or this [i.e., the existence of *minima naturalia*] depends on some extrinsic cause, such that a *minimum* must be posited because of this, i.e., that something smaller could not resist to the containing [medium], but it would be immediately converted into the containing [medium], as it is commonly said[594].

The passage is important for this thesis in that it supports the conclusion that, in the central decades of the first half of the 14th century, at Paris the only commonly admitted notion of *minima naturalia* in homogeneous material substances was that of *minima secundum corruptionem* (a development presumably due, in large part, to Boethius of Dacia's and Scotus' criticisms of "intrinsic" notions of *minima naturalia* in homogeneous material substances). Still, the way in which the doctrine of *minima secundum corruptionem* is understood by Burley appears to be extremely innovative. Indeed, Burley presents two arguments aimed at showing that the doctrine of *minima secundum corruptionem* cannot identify a "fixed" minimal quantity of matter in which the substantial form of a homogeneous material substance can exist:

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terminate quantitatis, scilicet minima pars que potest esse ignis in actu, et commento secundo septimi huius, dicit Commentator quod corpora naturalia non dividuntur in infinitum in eo quod sunt corpora naturalia, verbi gratia quam primum motum in igne est minma pars que potest esse ignis in actu. Ex quibus apparet quod de intentione Commentatoris est quod in naturalibus homogeneis est dare minimum quo minus non potest per se existere."

[594] GUALTERUS BURLAEUS, *Expositio in octo libros de Physico auditu*, Venetiis 1482, f. 20ra: "Sed ponendum hic est dubium : an istud sit ex natura intrinseca rei, ut scilicet propter hoc sit minimum dandum, quia nature forme talis specie repugnet reperiri in minori materia per se ita quod terminus in parvitate sit ex ipsa forma specifica, vel hoc est propter aliquam causam extrinsecam, ut scilicet propter hoc sit dare minimum, quia minus non posset resistere continenti, sed statim converteret in continens ut communiter dicitur."

> It must be said, as it seems to me, that if in homogeneous [substances] a *minimum* has to be posited, it is necessary that this is due to an intrinsic cause, because, that is, it is incompatible with such form to be found by itself in a smaller matter, because if it were only due to an extrinsic cause, then
>
> 1. if it had to be posited a *minimum* which can by itself resist to this containing [medium] contrary to itself, in case a containing [medium] less contrary by the double were given, the half of that *minimum* could by itself resist to that containing [medium] which opposes it with half of the strength [of the previous one], and so, given that it is given a containing [medium] less and less contrary to infinity, it follows that it cannot be posited a *minimum* unqualifiedly because of an extrinsic cause, i.e., because of the contrariety of the containing [medium].
> 2. Moreover, a *minimum naturale* can be corrupted by a containing [medium] contrary to itself, but every corruption which happens by a contrary [agent] is the end of an alteration, therefore, and [given that] every alteration happens in time [i.e., not instantaneously], that *minimum* which is being corrupted by the contrary containing [medium] for a [certain] time resists to that containing [medium]. But the *minimum* is weakened by its contrary in a continuous way. Therefore in half of that time which measures the alteration through which it is corrupted, that *minimum* is weaker than it was at the beginning; and, however, after that the *minimum* can resist to the containing [medium] for a second half of time. Therefore a smaller power than that of the *minimum* can resist to the containing [medium], because given any power whatsoever a smaller power of the same species can resist to the containing [medium] for a [certain] time, [although] not for such a time [than the first power][595].

The first argument notices that the notion of *minima secundum corruptionem* cannot be understood in absolute terms: rather, it requires a consideration of the relation between the power of the material substance considered and that of the containing medium, a relation which takes the form of a numerical proportion (albeit a very elementary one). The second argument, instead, attacks the very notion of *minima secundum corruptionem* on the assumption that the process of corruption of extremely small portions of homogeneous material substances existing on their own, such as very corruption (and therefore every substantial change) is a temporally extended process. If this is so, Burley

[595] GUALTERUS BURLAEUS, *Expositio in octo libros de Physico auditu*, Venetiis 1482, f. 20ra: "Dicendum est, ut mihi videtur, quod si in homogeneis sit dare minimum quod oportet quod hoc sit ex causa intrinseca, quia, scilicet, repugnat tali forme reperiri per se in minori materia, quia si solum esset ex causa extrinseca, tunc si sit dare minimum quod potest per se resistere huic continenti sibi contrario, si detur continens minus contrarium in duplo medietas illius minimum (*pro*: minimi) posset per se resistere illi continenti quod minus in duplo sibi contrariatur, et sic cum sit dare continens minus et minus contrarium in infinitum sequitur quod non est dare simpliciter minimum propter causam extrinsecam, idem <est> propter contrarietatem continentis. Item, minimum naturale potest corrumpi a continente sibi contrario. Sed omnis corruptio que fit a contrario est finis alterationis. Ergo et omnis alteratio fit in tempore illud minimum corrumpendum a continenti contrario per tempus resistit illi continenti, sed minimum continue debilitatur a suo contrario. Ergo in medio illius temporis mensurantis alterationem per quam corrumpitur est illud minimum debilius quam fuit in principio, et tamen post illud minimum resistit continenti per secundam medietatem temporis. Ergo minor virtus quam virtus minimi potest resistere continenti, quia quacumque virtute data minor virtus eiusdem speciei potest resistere continenti per tempus, quamvis non per tantum tempus."

argues, then any *minimum secundum corruptionem* can be infinitely divided according to the (potential) infinite divisibility of the time through which its corruption takes place, and, given any *minimum naturale* of a homogeneous material substance it is possible to find a smaller portion of the same homogeneous material substance which is capable to exist for a certain (shorter) interval of time while it is being corrupted by the action of the containing medium.

However, what is Burley's argument in support of the view that the corruption of extremely small portions of homogeneous material substances existing on their own, such as any corruption whatsoever, is a temporally extended process? The key to the solution is Burley's claim that "corruption is the end of an alteration" (*corruptio est finis alterationis*). Although Burley does not elaborate any further onto the idea in this context, it is rather clear that he is here making reference to his view, famously argued for in the *Tractatus primus*, composed presumably between 1319/1320 and 1323, thus a few years before his last *Physics* commentary, according to which, as already mentioned, accidents alone can cause the corruption of a substance and according to which, therefore, corruption is the inclusive limit of the process of alteration and, as such, the process of corruption broadly conceived becomes temporally extended according to the temporal extension of the alteration preparing corruption proper. True, here Burley simply claims that corruption is the end, therefore the limit, of alteration, without specifying whether this limit is to be interpreted as an inclusive or an exclusive one. Still, it would be really hard to make sense of his argument in this passage without assuming that he is here considering corruption to be the inclusive limit of alteration. It is thus thanks to the doctrine of substantial change adopted in the *Tractatus primus* that Burley can claim, in his discussion of *minima secundum corruptionem*, that corruption (and, by extension, substantial change) shares the temporally extended structure of alteration.

The conclusion that Burley reaches through his two arguments (especially through the second one) is a decisive one: if the only kind of *minima* that can be posited in homogeneous material substances are *minima secundum corruptionem*, then it better be assumed that there are no *minima* at all in them:

> And therefore if someone said that there is no *minimum* in homogeneous substances if not because of an extrinsic cause, he would have to say that there is no *minimum* in an unqualified way (*simpliciter*), but he would have to say that there is a circumstantiated *minimum* (*minimum circumstantionatum*), i.e., a *minimum* which

> could by itself resist to the containing [medium] contrary to it to a certain extent and for a certain time […][596].

Minima secundum corruptionem are only relative (or "circumstantiated") *minima*. Therefore, as Burley argues, someone who wanted to posit an absolute notion of *minima* in homogeneous material substances should rather claim that these *minima* exist due to an intrinsic cause, therefore falling back on some notion of "intrinsic" *minima naturalia*, such as Aquinas' *minima secundum formam*[597].

Still, being unable to find a decisive argument in favour of "intrinsic" *minima naturalia* (at least, presumably, one capable of resisting to Boethius' and Scotus' critiques), Burley says that:

> Nevertheless, if the authorities did not prevent it, probably it could be said that in homogeneous [material substances] there is no *minimum* in an unqualified way, because from the fact that homogeneous [material substances] are of the same species in the whole and in any part whatsoever, then [it follows that], as it is not incompatible with the whole to exist by itself so it is not incompatible with any part to exist by itself, because whatever positive [property] is incompatible by itself to some individual of a certain species, it is incompatible with any individual of the same species, as it appears, because every positive [property] which is incompatible with this whiteness is incompatible with any whiteness whatsoever. Given, therefore, that existing is something positive and [that] it is not incompatible with a homogeneous whole, it will not be incompatible with any part [of it], since any part is of the same nature with the whole[598].

Burley is here going one step further: not only the only argument in favour of "intrinsic" *minima naturalia* depends upon the (apparent) authorities supporting it, rather, there is a very strong metaphysical argument against any notion of "intrinsic" *minima naturalia* in

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[596] GUALTERUS BURLAEUS, *Expositio in octo libros de Physico auditu*, Venetiis 1482, f. 20ra: "Et ideo si aliquis dicat quod non est dare minimum in homogeneis nisi propter causam extrinsecam, ipse habet dicere quod non est dare simpliciter minimum, sed debet dicere quod est dare minimum circumstantionatum, scilicet minimum quod potest per se resistere continenti in tantum sibi contrario et per tantum tempus […]."

[597] Cf. GUALTERUS BURLAEUS, *Expositio in octo libros de Physico auditu*, Venetiis 1482, f. 20ra: "Melius, ut mihi videtur, est dicere quod illud sit ex natura intrinseca ipsius forme quam quod hoc sit propter causam extrinsecam, idem <est> propter contrarietatem continentis."

[598] GUALTERUS BURLAEUS, *Expositio in octo libros de Physico auditu*, Venetiis 1482, f. 20va-b "Verumtamen si auctoritates non obstarent probabiliter posset dici quod in homogeneis non est dare simpliciter minimum, quia ex quo homogenea sunt eiusdem specie in toto et in qualibet parte, tunc sicut toti non repugnat per se existere ita nulli parti repugnat per se existere, quia quicquid positivum per se repugnat alicui individuo alicuius speciei, et repugnat cuilibet individuo eiusdem speciei, ut patet, quia omne positivum repugnans huic albedini, repugnat culibet albedini. Cum ergo per se existere sit quoddam positivum et non repugnat toti homogeneo non repugnabit alicui parti, cum quelibet pars sit eiusdem nature cum toto."

inanimate homogeneous substances. This argument is based on the fact that the property of existence is compatible with any existing homogeneous whole, and therefore, given a principle of ontological similarity between any homogeneous whole and its parts, such a property is compatible with any part of an existing homogeneous whole, no matter how small. Although Burley does not quote any source for this argument, it is quite evident that it bears a – direct or indirect – influence of Scotus' analogous argument against the second interpretation of *minima naturalia* analysed above (and, through it, of the whole Oxford commentary tradition from which it is derived). Burley takes the metaphysical notion of metaphysical similarity between a homogeneous whole and its parts as being the key to the whole criticism of "intrinsic" *minima naturalia* in homogeneous material substances[599]. Nevertheless, he does add a further argument against them, which does not need to be discussed in detail here, based on the traditional dilemma concerning what will remain after the division of a homogeneous material substance (again, a traditional Boethian and Scotistic argument), which, however, takes on an original twist in Burley due to the fact that he reads it in combination with Burley's innovative conception of substantial change as applied to homogeneous material substances[600].

What, then, to say about the apparent contrary authorities? The solution to Aristotle's apparent belief in *minima naturalia* for homogeneous material substances in *Physics* I.4 is dealt with in a traditional fashion by Burley, supposing that Aristotle is here charging Anaxagoras with the claim that he should have admitted a *minima caro*, and not assuming it himself[601]. More complex is the passage from *De anima* II.4 usually taken to say that there is a fixed limit in smallness and greatness to all natural entities. Burley has an ingenuous solution to the interpretation of this passage: indeed, he restricts the scope of this passage (again, in a traditional way) to (heterogeneous) material substances. Yet,

[599] Cf. GUALTERUS BURLAEUS, *Expositio in octo libros de Physico auditu*, Venetiis 1482, f. 20vb: "Et confirmatur, quia repugnantia formalis de quo nunc loquemur, hoc est ratione forme et nature, et ideo cum eadem natura sit omnium individuorum eiusdem speciei, sequitur quod omne quod repugnat formaliter alicui individuo alicuius speciei repugnat omni individuo eiusdem speciei."

[600] Cf. GUALTERUS BURLAEUS, *Expositio in octo libros de Physico auditu*, Venetiis 1482, f. 20vb: "Item, si detur minimum, illud potest dividi, cum sit continuum. Quero tunc aut partes manebunt post [prius *del. et* post *add.*] divisionem vel non. Si sic, et cum pars sit minor suo toto, sequitur quod est dare minus minimo, quod est impossibile. Si vero detur quod partes non maneant post [prius *del. et* post *add.*] divisionem, tunc corrumpent statim completa divisione, et sic corrumpentur completa divisione nulla alteratione precedente, quod est impossibile, quia corruptio subiecti species est finis alterationis. Igitur non est dare minimum."

[601] Cf. GUALTERUS BURLAEUS, *Expositio in octo libros de Physico auditu*, Venetiis 1482, f. 20vb: "Ad auctoritatem Philosophi hic potest dici quod Philosophus supponit tamquam concessum hoc ab Anaxagora, quod est dare minimum."

and here lies his originality, according to his interpretation even in this case there are no *minima* or *maxima* in an unqualified way, rather, they exist only insofar as "natural" processes of augmentation and diminution are concerned, that is, those directly caused by the soul as the substantial form of such substances, but not insofar as violent changes (i.e., those caused by external entities) are concerned, such as gaining weight (*impinguare*) and losing it[602].

2.12.2. William of Ockham's Position on *Minima naturalia* in Comparison with Burley's One: Parisian Innovations and Oxford "Traditionalism"

The originality of Burley's position on *minima naturalia*, together with the fact that such position is better understood as part of the debate taking place in Paris, rather than as an unlikely outcome of the discussion at Oxford, can be seen by comparing it with that of William of Ockham (ca. 1287-1347). Ockham composed two main commentaries on the *Physics*, the incomplete *Expositio* (breaking off at the beginning of Book VIII) dating presumably to 1322[603] and the *Quaestiones in libros Physicorum Aristotelis* dating before 1324 (possibly to the academic year 1323-1324)[604], where, although the questions do not follow explicitly the order of Aristotle's topics, they bear nonetheless important relations with them. To these, one should also add two other works broadly regarding the

[602] Cf. GUALTERUS BURLAEUS, *Expositio in octo libros de Physico auditu*, Venetiis 1482, ff. XXvb-XXIra: "Sed dubium est de etherogeneis, ut puta de animatis. Non enim verum <est> quod in illis sit dare maximum et minimum, quia si esset dare maximum hominem, iste non posset fieri pinguior quam prius, quia si fieret pinguoir fieret maior, et sic esset dare maius maximo, quod est impossibile. Similiter si esset maximus homo, aliquis posset eum percutere sic quod caro elevaretur, et sic fieret maior. […] Et eodem modo probatur quod non est dare minimum hominem, quia sic ablata quacumque parte ab eo quantumcumque parva statim minoretur, alioquin esset dare minus minimo. Dicendum igitur quod in homogeneis non est dare maximum nec minimum possibile in tali specie, tamen in etherogeneis ut in animatis est dare maximum et minimum possibile in tali specie, sic quod per augmentationem naturale in qua quelibet pars aucti augetur non potest fieri individuum maius in illa specie, nec per diminutionem naturalem in qua quelibet pars diminuti est diminuta potest fieri individuum minus in illa specie. Tamen credo quod non sit dare maximum et minimum quin per violentiam possit fieri maius vel minus, et etiam per impinguationem et eius oppositum possit fieri maius vel minus, quoniam impinguatio non est augmentatio nec eius oppositum est diminutio, quia augmentatio et diminutio non fiunt nisi quando fit maioratio vel mino|f. XXIra|ratio in partibus solidis ut in ossibus et nervis secundum quod vult Avicenna, sed per impinguationem et macrefactionem non fit maioratio vel minoratio in partibus solidis, ut patet manifeste."
[603] Cf. GUILLELMUS DE OCKHAM, *Expositio in libros Physicorum Aristotelis. Prologus et Libri I-III (Opera Philosophica IV)*, ed. V. RICHTER, G. LEIBOLD, St. Bonaventure, NY, Editions of the Franciscan Institute of St. Bonaventure University, 1985.
[604] Cf. GUILLELMUS DE OCKHAM, *Brevis summa libri Physicorum, Summula philosophie naturalis et Quaestiones in libros Physicorum Aristotelis (Opera Philosophica VI)*, ed. BROWN.

topics discussed in Aristotle's *Physics*. The first one is the *Summula philosophiae naturalis* (possibly dating between 1319 and 1324, where, however, there is no explicit reference whatsoever to the issue of *minima naturalia*, so that this work will be left out of consideration here). The second one is the *Brevis Summa libri Physicorum* (dating between 1322 and 1323, where, however, Ockham merely inserts a passing remark concerning *minima naturalia*, which bears witness to his awareness of the fundamental distinction between *minima* in potency – within the whole to which they belong – and *minima* in act – existing on their own – based on *De sensu* 6, although in other passages Ockham is keen on remarking that the notion of 'potency' involved here still refers to parts which, in themselves, exist in act, not like the way in which a black body is in potency white)[605]. As a result, in what follows I will focus exclusively on the *Expositio* and the *Quaestiones*[606].

Interestingly, Ockham's position on *minima naturalia* is not the same in the two mature works. Nevertheless, both are far closer to 13th-century terminology and concepts than to the contemporary developments taking place at Paris and already featuring in Burley's last *Physics* commentary.

Indeed, in the *Expositio in libros Physicorum Aristotelis*, Ockham mainly resorts to a traditional presentation of the view of *minima secundum corruptionem* (read, however, according to Scotus, as positing a merely "extrinsic" kind of *minima naturalia* in homogeneous material substances):

> But it appears that this argument supposes a falsity, namely, that there is a minimal flesh, in that every flesh is a quantity; but a quantity is infinitely divisible; therefore it is impossible to reach some *minimum* that cannot be further divided. To this, it is possible to reply in two ways. First that minimal flesh can be considered in two ways. Or as flesh which lacks a part smaller than the whole; and in this way no flesh is minimal, because every flesh has a smaller part which nevertheless is truly flesh. Or what I say, 'minimal flesh', can be considered as flesh of which no other smaller one can exist by itself; and in this way there is a minimal flesh, and in this way speaks Aristotle here [i.e., in *Physics* I.4]. However, it must be known that this is only for

[605] GUILLELMUS DE OCKHAM, *Brevis Summa libri Physicorum*, Liber I, cap. 2, ed. BROWN, p. 18, ll. 24-34: "Nec huic obstat quod hic dicit Aristoteles: quod est dare minimam carnem, cum hoc totum dicat recitando. Dicit enim Philosophus quod non est dare minimam magnitudinem quin habeat partes minores toto, licet sit talis res quali non potest minor exsistere per se."

[606] For a general presentation of Ockham's natural philosophy, and of the relation between his different works on natural philosophy, see especially A. GODDU, *The Physics of William of Ockham (Studien und Texte zur Geistesgeschichte des Mittelalters 16)*, Leiden-Köln, Brill, 1984, and ID., *Ockham's Philosophy of Nature*, in P.V. SPADE (ed.), *The Cambridge Companion to Ockham (Cambridge Companions to Philosophy)*, New York, NY, Cambridge University Press, 1999, ch. 7, pp. 143-167.

> an extrinsic cause; indeed, given any flesh whatever, however small, if there were no extrinsic corrupting cause, a smaller flesh could exist by itself. It is enough, however, for Aristotle against Anaxagoras that a smaller flesh cannot exist [by itself] *de facto*[607].

Two things are remarkable in the passage. The first one is that Ockham still clearly resorts to the very traditional Oxford argument against the existence of intrinsic *minima naturalia* in homogeneous material substances based on the definition of a homogeneous body. This is the same argument that had been attacked by Wylton and that had also been replaced by an analogous but more refined metaphysical argument (of which there is no trace in the passage just quoted) in Scotus and, probably under his influence, also in Burley. Nevertheless, one aspect that links Ockham's presentation of the view of *minima secundum corruptionem* to the more modern phases of the debate on *minima naturalia* is, as said, his explicit characterisation of this view as merely positing "extrinsic" *minima naturalia* in homogeneous material substances. In general, however, what is most important to remark is the brevity of Ockham's discussion of *minima naturalia*, an aspect that, as I will now show, characterises also the *Quaestiones*. It seems therefore likely that the reason for Ockham's mostly traditional discussion(s) of the issue is linked to his lack of interest in this specific topic, rather than to any particularly relevant doctrinal or historical reason. Nevertheless, it might be that Ockham's lack of interest in the topic might, *in itself*, represent an effect of Scotus' criticisms and bear witness to their effectiveness.

In his *Quaestiones in libros Physicorum Aristotelis*, a text which, as said, does not strictly follow the order of Aristotle's *Physics*, there is no specific *quaestio* devoted to the issue of *minima naturalia*. Nevertheless, in q. 81, while discussing the issue of the existence of minimal parts in motion, Ockham writes:

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[607] GUILLELMUS DE OCKHAM, *Expositio in libros Physicorum Aristotelis. Prologus et Libri I-III (Opera Philosophica IV)*, Liber I, cap. II, § 4, ed. RICHTER, LEIBOLD, p. 114, l. 10-p. 115, l. 23: "Sed videtur ista ratio supponere falsum, scilicet quod sit dare carne minimam, eo quod omnis caro est quanta; sed quantum est divisibile in infinitum; ergo non potest deveniri ad aliquod minimum quin possit ulterius dividi. Ad istud potest dupliciter responderi. Prmo quod caro minima dupliciter accipi potest. Vel pro carne carente parte minore toto; et sic nulla caro est minima, quia quaelibet caro habet partem minorem quae tamen vere est caro. Vel potest hoc quod dico 'caro minima' accipi pro carne qua nulla alia minor potest per se exsistere; et sic potest dari caro minima, et sic loquitur hic Philosophus. Tamen sciendum est quod hoc non est nisi propter causam extrinsecam; quacumque enim carne data quantumcumque parva data nisi esset causa aliqua extrinseca corrumpens, [caro minor] posset per se exsistere. Sufficit autem Aristoteli contra Anaxagoram quod non possit de facto exsistere caro minor."

It is confirmed that in a successive change which originates from an intrinsic principle, such as the motion of animals, there is a first mobile part that is moved, because Averroes, in the second comment [on Book VII of the *Physics*[608]], talking of such motions, says that "it is necessary that there is a first moved [part], because natural bodies are not infinitely divided in that they are natural bodies. For instance, <because> the first moved [part] in <fire> is the minimal part that can be fire in act." [Averroes], however, calls fire in act, that fire which can in the proper operation of fire, and such minimal fire is called the first moved part. And the cause of this can be in animals, because such motion is the proper operation of this motion and its action. Nevertheless, the action of any entity whatsoever needs a determined quantity, so that it cannot originate from a smaller quantity, and a determined quality so that it cannot originate from a weaker quality[609], such as it can be inferred from [Averroes' *Long Commentary* on] *Physics* VI, comment 91[610], and [Averroes' *Long Commentary* on] *De caelo* I, comment 95[611], and [Averroes' *Long Commentary* on] *Metaphysics* V, comment 21[612], and [Averroes' *Long Commentary* on] *Physics* VI, comment 32[613]. Therefore, in these [entities] that are so moved by an intrinsic principle there is a first moved [part], and this because such action is received in the agent and that action needs a determined quantity so that it cannot be caused by a smaller one, and as a consequence it cannot be received in a smaller quantity, because it is caused by the same [entity] in which it is received, and this can be called heart or some part of it[614].

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608 Cf. AVERROIS CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 140va, a text already discussed above while analysing Averroes' doctrine of *minima naturalia*.

609 Here, remarkably, Ockham presents even what could be considered as a proper doctrine of *minima sensibilia*. Indeed, focusing on the case of fire, whose proper operation, that of heating, is performed by the substantial form through the accidental form of the primary quality of hotness, Ockham explicitly states that such a quality (as all sensible qualities, presumably) is only able to perform its proper operation when it is present in a sufficient quantity of a material substance. If one, then, takes Ockham's explicit statement in q. 82, quoted below, that even smaller portions of matter preserve their substantial form, although such substantial form is unable to perform its proper operation, to apply to sensible qualities as well, one gets a picture according to which Ockham believes that sensible qualities could (at least as a hypothetical case, in the absence of the corrupting action of the containing medium) exist in extremely small portions of material substances, where they are unable to perform their proper operation. This would put Ockham's view on *minima sensibilia* rather close to a certain strand of the debate originating at the Parisian Faculty of Arts around the time of Radulphus Brito, at the end of the 13th century. On this issue, see Chapter 4.

610 Cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, ff. 138vb-139ra.

611 Cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de coelo, de generatione et corruptione, meteorologicorum, de plantis libri, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis, apud Junctas, 1562, f. 30va.

612 Cf. AVERROES CORDUBENSIS, *Aristotelis metaphysicorum libri XIIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metaphysicorum liber*, Venetiis 1562, f. 61rb.

613 Cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 122ra-va.

614 GUILLELMUS DE OCKHAM, *Quaestiones in libros Physicorum Aristotelis*, q. 81, in GUILLELMUS DE OCKHAM, *Brevis summa libri Physicorum, Summula philosophie naturalis et Quaestiones in libros Physicorum Aristotelis*, ed. BROWN, p. 618, ll. 50-67: "Confirmatur [quod in transmutatione successiva quae est a principio intrinseco, sicut est in motu animalium, est dare primam partem mobilem quae movetur], quia Commentator, commento 2 [cf. AVERROIS CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentariis*, Venetiis 1562, f. 140va], loquens de huiusmodi motibus, dicit quod 'necesse est dare prima mota, quia corpora naturalia non dividuntur in infinitum in eo quod sunt corpora naturalia. Verbi gratia, <quoniam> primum motum in <igne> est minima pars quae potest esse ignis in actu'. Ignem autem in actu vocat illum ignem qui potest in propriam operationem ignis, et talis ignis minimus dicitur prima pars mota. Et huius causa potest esse in

Although Ockham is here focusing his discussion on living beings, his view can certainly be extended also to inanimate homogeneous substances (as Ockham makes clear in more explicit terms in q. 82[615]). The view he presents is certainly an instance of what I have referred to as the doctrine of *minima secundum operationem*, and this is a noteworthy fact[616]. Indeed, such a view, as I have shown above, while being present in the mid-13th century both at Oxford and Paris, it is certainly not the predominant view in the late 13th century or in the early 14th century, not even at Oxford, where, as I have said above, *minima secundum actionem* tend to be the largely hegemonic doctrine of *minima naturalia*. The fact that Ockham, instead, resorts here to *minima secundum operationem* is remarkable, since it implies a rejection of the traditional Oxford belief in the fact that substantial and accidental forms, in homogeneous material substances, are always "active", no matter whether or not they are able to achieve their action (specifically, their proper operation).

Still, Ockham's adoption of the doctrine of *minima secundum operationem* is explicitly motivated by a number of relevant quotations from Averroes, the most important one being the text, in Averroes' *Long Commentary* on *Physics* VII, where Averroes explicitly admits the existence of a first moved part in motion. Such a text, as

animalibus, quia huiusmodi motus est propria operatio istius moti et actio eius. Actio autem cuiuscumque rei requirit certam quantitatem, ita quod a minori quantitate pervenire non potest, et certam qualitatem ita quod a debiliori qualitate pervenire non potest, sicut potest colligi VI *Physicorum*, commento 91, et I *De caelo*, commento 95, et V *Metaphysicae*, commento 21, et VI *Physicorum*, commento 32. In his igitur quae sic moventur a principio intrinseco est dare primum motum, et hoc quia talis actio recipitur in agente et illa actio requirit certam quantitatem ita quod a minori non potest causari, nec per consequens in minori quantitate recipi, quia ab eadem causatur in qua recipitur, et hoc potest dici cor vel aliqua pars eius."

[615] Cf. *infra*.

[616] As it will become clearer by looking at the next passage I quote in the main text, there is at least an aspect of the doctrine of *minima naturalia* adopted by Ockham in the passage from the doctrine of *minima secundum operationem* as I have presented it in this chapter. Indeed, contrary to the traditional understanding of *minima secundum operationem*, it appears that the only kind of action Ockham is concerned with is the "proper operation" of the substantial forms of material substances (an aspect that, as seen above, had taken centre stage at Paris around the time of Brito and Jandun). Still, it is rather clear from Ockham's wider discussion that, insofar as a substantial form is considered able to exist even in portions of matter too small for it to possess the power to perform its proper operation, Ockham's doctrine can certainly be classified as a *sui generis* doctrine of *minima secundum operationem* (and, therefore, as a very different doctrine than Brito's and Jandun's ones that, although focusing on the power for substantial forms to perform their proper operation, contrary to Ockham, are based on the idea that a substantial form (at least of a homogeneous material substance) cannot exist in portions of matter too small for it to be able to perform its proper operation). Still, Brito's and Jandun's doctrines of *minima sensibilia* (specifically Jandun's one, which appear also to hold for some kinds of substantial forms), as I will show in Chapter 4, certainly come closer to Ockham's doctrine of *minima naturalia secundum operationem*.

shown above, is indeed at the centre of Averroes' doctrine of *minima naturalia*, and the fact that it is here used by Ockham as a central text in the context of a discussion of *minima* in material substances (although, it is true, in the context of a *quaestio* devoted to motion) clearly shows, if any further proof were needed, that Medieval Latin commentators had thus correctly understood Averroes' doctrine of *minima naturalia* as applying to material substances, although it was mostly presented in the context of a discussion on motion.

Significantly, however, Ockham does not interpret Averroes as supporting the view of *minima secundum formam*. Ockham, to put it in other words, remains convinced (in the *Quaestiones* as in the *Expositio*) that there is no portion however small of a (homogeneous, at least) material substance that cannot preserve its substantial form (if not for an extrinsic cause). Nevertheless, in the *Quaestiones*, a close confrontation with Averroes (that was lacking in the discussion on *minima naturalia* in the *Expositio*) evidently convinced Ockham to admit at least an intrinsic limit to the division of homogeneous material substances. Not, however, a limit related to the persistence of substantial forms themselves, as in the correct reading of Averroes' texts (and, more notably, as in Wylton's interpretation of them, as seen above), but a limit merely related to the quantity of matter in which such substantial forms have the power to act (and, specifically, to perform their proper operation). It is in this way that Ockham interprets Averroes' notion of a minimal part of fire *quae potest esse ignis in actu* as referring not to a minimal part of fire which can be informed by the substantial form of fire, but as a minimal part of fire that has the power to act (and where, specifically, its substantial form has the power to perform its proper operation)[617].

[617] Notably, the same text from Averroes' *Long Commentary* on *Physics* VII also found different interpretations in the Oxford tradition of the first half of the 14th century (while always being understood in relation to the issue of *minima* in material substances). For instance, John Dumbleton referred to this text in order to argue for a different view, i.e., that of *minima secundum sensum*. Indeed, Dumbleton's discussion of *minima naturalia* is an extremely interesting case of a 14th-century view of *minima secundum sensum*, which not only shows the persistence of this position in the Oxford commentary tradition (Dumbleton's *Summa logicae et philosophiae naturalis* is probably one of the best sources of information for the teaching at Oxford Faculty of Arts in the second quarter of the 14th century), but also the fact that such a position could be explicitly considered a legitimate interpretation of Averroes' doctrine of *minima naturalia* as presented in the *Long Commentary* on *Physics* VII.2 (cf. IOANNES DE DUMBLETON, *Summa logicae et philosophiae naturalis*, Pars 6, cap. 21, ms. Cambridge, Peterhouse, 272, f. 56r-v, quoted according to MURDOCH, *The Medieval and Renaissance Tradition of* Minima Naturalia, *op. cit*., pp. 109-110, nn. 56 and 57: "Pro processu tamen Philosophi et Commentatoris allegato est intelligendum, quod minimum in aliqua specie accipitur dupliciter: uno modo pro minimo naturali, id est apud naturam, quo minus natura non permittit nec permittere potest existere per se in illa specie; et isto modo non est dare minimum nec

That this is so (and that Ockham's view of *minima secundum operationem* applies to all material substances, both homogeneous and heterogeneous) is confirmed by looking at q. 82, where Ockham remarks the following:

> To these [i.e., arguments to the contrary]: to the first, that in every species of natural entities there is a *minimum* and a *maximum*, I say that wherever Aristotle and Averroes say that there is a *minimum* in natural entities, understanding [these remarks] about a *minimum* which can perform the action of that species [i.e., substantial form], such as Averroes says, in *Physics* VII, in the second comment [the same passage quoted in q. 81], that a first moved part in fire is the first part that can be fire in act, and by fire in act intends that which can perform the proper operation of fire. And such fire needs a determined quantity, such as [a determined] quality, as it has been said above [cf. q. 81, p. 618, ll. 63-67], still a smaller [part of] fire can exist by itself, even though it cannot perform the operation of fire[618].

Apart from any further remark on Ockham's discussion of *minima naturalia*, what bears underlining here is that, throughout his entire *corpus*, his position on the issue remains rather traditional and alien to the contemporary debate taking place at Paris, to which Burley's discussion of *minima naturalia* in his last *Physics* commentary fully belongs. It is therefore now time to turn to the authors whose views on *minima naturalia* contributed, together with Burley's one, to the innovative character increasingly taken on by the Parisian debate on *minima naturalia* in the first half of the 14th century.

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maximum quod non […]. Secundo modo dicitur minimum in natura, quo minus per se non potest percipi a sensu vel quod de facto primo nobis apparet in alteratione transmutatum seu quod quo ad nos est minimum sensibile, quia non minus eo pro tunc apud nos determinatur per se […]. Quare notandum est quod Aristoteles hic accipit contra Anaxagoram minimum in natura secundum quod est sensibile per se. Et sic procedit contra Anaxagoram argumentum Philosophi: si ergo sit minima aqua sensibilis per se, et ex illa generetur ignis sensibilis per exitum, et ex illo igne iterum aqua, et sic infinities, cum omnia, que apparent ex illa aqua fieri, sunt in illa aqua in actu, ut posuit Anaxagoras, ergo infinita sensibilia per se nunc sunt in aqua data, vel sequitur quod cessabit generacio (ita solum finita sensibilia minima continet illa aqua) vel quod illa aqua habet infinita equalia non communicancia per se sensibilia. Nam licet appareat (*ms*. apparet) ex textu in primo *Phisicorum* et Commentatore, quod Aristoteles innuit dare minimum naturale, quo minus non potest in illa specie existere, tamen ratio magna est in contrarium […] scilicet quod intelligende sunt de minimo sensibili per se. […] Item, ista auctoritates (*sic!*) in 7 commento 2 que dicit quod est minimum ignis qui potest per se existere, intelligenda est de minimo sensibili per se et non alio modo").

[618] GUILLELMUS DE OCKHAM, *Quaestiones in libros Physicorum Aristotelis*, in GUILLELMUS DE OCKHAM, *Brevis summa libri Physicorum, Summula philosophie naturalis et Quaestiones in libros Physicorum Aristotelis*, q. 82, ed. BROWN, p. 622, ll. 53-61: "Ad ista: ad primum [quod in omni specie rerum naturalium est dare minimum et maximum] dico quod ubique dicunt Philosophus et Commentator quod contingit dare minimum in rebus naturalibus, intellecto de minimo quod potest agere actionem illius speciei, sicut dicit Commentator, VII *Physicorum* commento 2, quod primum motum in igne est minima pars quae potest esse in actu ignis, et per ignem in actu intelligit illum qui potest in propriam operationem ignis. Et talis ignis requirit quantitatem determinatam sicut qualitatem, ut supra dictum est, tamen minor ignis per se potest exsistere, licet non possit in operationem ignis."

2.12.3. John Buridan: *Minima secundum corruptionem* and the "Piecemeal" View of Substantial Change

The next author to discuss, concerning the Parisian debate on *minima naturalia* of the first half of the 14th century, is John Buridan. As I have mentioned in the previous chapter, Buridan devoted a number of different commentaries to the *Physics*, both in the form of the *Expositio* and in that, way more popular at his time, of the *Quaestiones*. Although much research is still needed in the manuscript tradition of these works, it can be safely said that we have at least one version of the *Expositio* (possibly two) and three versions of the *Quaestiones* (although, from their numbering, it can be ascertained that at least four of them originated from Buridan's courses at the Parisian Faculty of Arts). The most popular version of the *Quaestiones* (it is preserved in 32 manuscripts), is the so-called *ultima lectura*, that is, the last (and possibly also the only one explicitly authorised by Buridan) version of them, which was printed in 1509 and which has partially received a critical edition in recent years[619]. Nevertheless, we also possess six manuscripts clearly referring to a different set of *Quaestiones* (presumably the third one, since some of them explicitly label it as such)[620], and two other manuscripts that also include what could be

[619] As already mentioned in the previous chapter, the questions on the first two Books of the *Physics* have recenty been edited as JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis (secundum ultimam lecturam). Libri I-II*, ed. STREIJGER, BAKKER, with a guide to the text by SYLLA, while the edition of the questions on Books III and IV has recently been published as JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis (secundum ultimam lecturam). Libri III-IV*, ed. STREIJGER, BAKKER, with a guide to the text by SYLLA. For a presentation of the main doctrinal aspects of Buridan's commentary to *Physics* I and II, together with the wider context in which they found their place, see especially the extended SYLLA, *Guide to the text*, in JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis (secundum ultimam lecturam). Libri I-II*, ed. STREIJGER, BAKKER, pp. xliii-clxxv.

[620] The manuscripts are the following ones: ms. Augsburg, Staats- und Stadtbibliothek 2° 342°, ff. 2ra-136vb; Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, F.298, ff. 1v-45r (E); ms. Kraków, Biblioteka Jagiellońska, 635, ff. 1°-170° (K) (only including the portion of the text between q. I.8, which is incomplete, and q. VIII.14); ms. Toulouse, Archives départementales de la Haute-Garonne 6, ff. 35rb-141rb (from q. II.5 to q. VIII.15); ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Chigi lat. E.VI.199, ff. 1ra-99vb (V), and ms. Zaragoza, Biblioteca Capitular de la Seo, 15-61, ff. 1r-201v (from q. I.1 to q. II.8). The reference to the fact that the text represents Buridan's third set of *Quaestiones* on the *Physics* (*tertium opus*) is contained in the Toulouse, Vatican and Zaragoza manuscripts. For the edition of the last question of this version of Buridan's *Quaestiones*, the one on the power of the first mover, which is only present in two of the manuscripts, see J. CELEYRETTE, *Jean Buridan: Tertia lectura de la* Physique*: la question de la puissance du premier moteur*, in C. ANGOTTI, M. BRINZEI, M. TEEUWEN (eds.), *Portraits de maîtres offerts à Olga Weijers*, Fédératione Internationale des Instituts d'Études Médiévales, Louvain-la-Neuve, 2012, pp. 259-268, where it is also possible to find very important considerations of the manuscript tradition of the work as a whole, confirming the idea that this version of the text, differently from the *ultima lectura*, represents a mere *reportatio* of the work. In what follows I will quote the text according to a transcription prepared by Jean Celeyrette (whom I wholeheartedly thank for having shared

a (partial) different version of the *Quaestiones* (the first or the second one)[621]. Although it is very difficult to propose a relative chronology of the works, it might be quite reasonably claimed that both the *tertia lectura* and the *ultima lectura* are to be dated to the 1350s. The editors of the first two Books of the *ultima lectura* propose the period "between 1352 and 1357", on the basis of a number of different considerations[622]. The *tertia lectura*, instead, is very likely to be dated before 1352, insofar as one of the manuscripts preserving the text, the ms. Erfurt, Universitätsbibliothek, F.298, is dated to 1352, but the editors of the *ultima lectura*, based on Anneliese Maier's studies, suggest an even earlier date, around 1350[623]. Although there are no precise indications of the dating of the previous set of *Quaestiones*, it might reasonably be argued that it cannot predate the later sets of *Quaestiones* significantly. Still, the possibility that they predate Oresme's *Physics* commentary (itself presumably written before 1347, as I will say below), or that they are at least contemporaneous with it, justifies, I believe, the discussion of Buridan's position on *minima naturalia* in his commentaries on *Physics* I.4 before taking into consideration Oresme's one.

It has already been noted multiple times by scholars that the three extant versions of the *Quaestiones* do not generally show relevant doctrinal differences, at least concerning a number of significant issues. This is also generally the case for the conception of *minima naturalia* that emerges from them while dealing with the text of

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the text with me), based on the Erfurt and the Vatican manuscripts, with the significant variants of the Kraków manuscript.

[621] They are the following ones: ms. Cesena, Biblioteca Malatestiana, S.VIII.g, ff. 5ra-74vb (C) and ms. Toulouse, Archives départementales de la Haute-Garonne, 6, ff. 2ra-35rb (T). The two texts coincide until q. II.4. After that, the Cesena manuscript includes a collection of questions that might be by Buridan, without corresponding to any of the other known ones, until q. VII.3, while, starting with q. VII.4, the text presents a collection of questions that are attributed to Albert of Saxony in other manuscripts. The Toulouse manuscript, instead, starting with q. II.5 reports the text of Buridan's *tertia lectura*, explicitly labelled as such. Concerning the text of the Cesena manuscripts, see especially J. CELEYRETTE, *Les Questions sur* la Physique *du ms Cesena Malatestiana SVIII 5*, in C. GRELLARD (ed.), *Miroir de l'amitié. Mélanges offerts à Joël Biard (Études de philosophie médiévale)*, Paris, Vrin, 2017, pp. 353-370. In what follows I will quote the text according to a transcription prepared by Jean Celeyrette (whom I wholeheartedly thank for having shared it with me) based on the Cesena manuscript but taking into account all the relevant variants of the Toulouse one.

[622] Cf. JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis (secundum ultimam lecturam). Libri I-II*, ed. STREIJGER, BAKKER, Introduction, pp. xvii-xviii.

[623] Cf. JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis (secundum ultimam lecturam). Libri I-II*, ed. STREIJGER, BAKKER, Introduction, p. xvii, with the reference to A. MAIER, *Studien zur Naturphilosophie der Spätscholastick. Vol. 2. Zwei Grundprobleme der scholastischen Naturphilosophie: Das Problem der intensive Grösse, die Impetustheorie*, Roma, Edizioni di Storia e Letteratura, 1968, pp. 368-369 and p. 203.

Physics I.4[624]. Therefore, in what follows I will present Buridan's position according to q..13 on Book I of the *Physics*, *Utrum entia naturalia determinata sint ad minimum*, of the *ultima lectura* (which, in any case, remains likely the only authorised version of Buridan's *Quaestiones*). Nevertheless, I will also compare the main elements of such position with Buridan's parallel discussions in the other two extant versions of the *Quaestiones*[625].

The first element to note in Buridan's discussion of *minima naturalia*, in all the versions of the *Quaestiones*, is that he almost exclusively focuses on the idea of *minima secundum corruptionem* (in homogeneous material substances) as the only relevant notion of *minima* in homogeneous material substances to be taken into consideration. When discussing it, moreover, Buridan shows to be fully aware of Burley's position. This is evident in all three versions of the *Quaestiones*, where Buridan seems to make reference to it already in presenting the arguments *quod non* concerning the existence of *minima naturalia*. The relevant passage in the *ultima lectura* reads as follows:

> But to this [i.e., that there are no *minima naturalia* in material substances] it is usually said that before the division any part of flesh whatsoever is flesh, but upon division the form of flesh is corrupted and another is generated. Therefore it is said that, even though for any flesh there is a smaller one existing in the whole [to which it belongs], nevertheless there is a minimal flesh in this way, that none smaller than it can subsist on its own by itself. Against this it is objected because: the form of flesh cannot be corrupted without a previous alteration (*sine alteratione praevia*); and that alteration is not instantaneous, but a temporal change *(illa alteratio non est instantanea, sed motus temporalis*); therefore it is necessary that the parts of that flesh which you say [is] divided remain [i.e., persist] for some time (*manere aliquo tempore*) and so there will be [something] smaller than the minimal [flesh] and existing by itself on its own. Moreover, God at least could preserve those parts by themselves, for any time He wanted, etc.[626]

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[624] With the very important exception that the "piecemeal" view of substantial change that grounds it is not present in the text of the *prima* or *secunda lectura*, as I will show below. In this version of the *Quaestiones*, therefore, Burley's influence still seems to constitute the fundamental factor in orienting Buridan's solution to the issue of *minima naturalia* and, especially, his denial of the existence of "absolute" *minima secundum corruptionem*.

[625] I will not consider, instead, the discussion of *minima naturalia* in the (two versions of the) *Expositio*, given the fact that, as far as I have been able to see by a preliminary study of the text, it can hardly add anything of value to the reconstruction of Buridan's position on the issue that I provide in what follows.

[626] JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis*, Liber I, q. 13, ed. STREIJGER, BAKKER, p. 137, l. 18-p. 138, l. 6: "Sed ad hoc solet dici quod ante divisionem quaelibet pars carnis est caro, sed apud divisionem corrumpitur forma carnis et generatur aliud. Ideo dicitur quod, quamvis omni carne sit caro minor inexistens toti, tamen sic est minima caro quod nulla minor potest seorsum per se subsistere. Contra hoc obicitur quia: non potest forma carnis corrumpi sine alteratione praevia; et illa alteratio non est instantanea, sed motus temporalis; igitur necesse est illius carnis quam dicis divisam, partes divisas manere aliquo tempore et sic erit minus minimo et per se seorsum subsistens. Item Deus saltem potest illas partes

Leaving aside the reference to God's absolute power, that, in this context (as more generally in this *quaestio*), plays a merely negative role, it is rather clear from the passage that Buridan is familiar with Burley's view of corruption as the inclusive limit of alteration[627]. It is also clear from the passage that the view Buridan discusses here is not directly Burley's one (which he explicitly rejects elsewhere in q. 5 on Book II of the *ultima lectura* and that, by the time he wrote the commentary, had already been forcefully attacked). Rather, Buridan limits himself to remarking that merely assuming an intimate connection between alteration and substantial change[628] it is possible to devise an argument (albeit, as I will show below, one that Buridan ultimately takes to be insufficient) against any "absolute" notion of *minima secundum corruptionem* structurally analogous to the one employed by Burley, that is, an argument based on the

seorsum conservare, quantocumque tempore vellet etc." The corresponding passage from the *prima* or *secunda lectura* reads as follows. "Quinto**,** si capiatur caro minima ad<h>uc ista habebit extensionem (*condensationem* T) et erit divisibilis. Et si dividatur, partes non statim corrumpuntur in instanti quia non corrumpitur aliquod corpus sine alteratione precedente, et sic ad<h>uc quelibet pars aliquo tempore manebit caro, et erit minor ista tota prius accepta que ponebatur minima. Et sic iterum esset minus minimo quod est falsum" (C, f. 12va, ms. T, f. 15ra-b). The corresponding passage from the *tertia lectura*, instead, reads as follows: "Item (*om*. V) detur caro minima, illa erit divisibilis quia continua, *tunc dividatur* (V, K; *quia continuatur* E) ; constat (*om*. V) quod partes *non in instanti* (*in instanti non dividentur nec* V) corrumpentur quia necesse est quod corruptionem precedat alteratio, et quia est ibi aliqualis (V, K; *equalis* E) resistentia, ergo cum (V, K, *om*. E) erit pars sic (*om*. V) minor toto, erit dare carnem minorem minima. Et non est dubium quod per potentiam divinam (*om*. V) posset reservari forma substantialis carnis quantumcumque caro dividitur, ideo, cum (V, K; *om*. E) in infinitum ipsa sit divisibilis (V, K; *indivisibilis* E), sequitur quod omni carne data posset dari minor caro etiam per se seorsum existens" (V, f. 12rb, E, f. 6vb, K, f. 12b).

[627] We know this even independently from Buridan's discussion of it in q. 13 on Book I of the *ultima lectura* (and in the corresponding passages of the other versions of the *Quaestiones*). Indeed, q. 5 on Book II of the *ultima lectura*, *Utrum in istis substantiis materialibus formae substantiales sint principaliter activae suorum motuum et suarum operationum vel magis qualitativae dispositiones illarum substantiarum*, a question not normally discussed in previous and contemporary *Physics* commentaries, seems to have been directly motivated by Burley's views concerning accidental causality and, specifically, the relation between alteration and substantial change. In the *quaestio*, ultimately, Buridan rejects Burley's views. Interestingly, in the question it becomes clear that probably the main reason why Buridan does not endors Burley's view of substantial change as the inclusive limit of alteration is his belief in the principle according to which "numquam proveniret effectus novus sine agente aeque nobili vel nobiliori" (JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis*, Liber II, q. 5, ed. STREIJGER, BAKKER, p. 276, ll. 3-4), a principle frequently appealed to in criticisms of Burley's view throughout the Late Middle Ages.

[628] Indeed, in all versions of the *Quaestiones* Buridan deems it necessary to stress repeatedly (certainly more frequently than it would have been needed for the argument's purposes) the intimate connection between the process of alteration and that of substantial change, having recourse to formulas such as "non corrumpitur aliquod corpus sine alteratione precedente" (C, f. 12va, T, f. 15rb), "omnem corruptionem rei debet precedere alteratio" (C, f. 12va, T, f. 15va), "necesse est quod corruptionem precedat alteratio" (V, f 12va, E, f. 6vb, K, f. 12a), "corruptio indigeret alteratione precedente" (V, f. 12va, E, f. 7ra, K, f. 13a), "non potest forma carnis corrumpi sine alteratione praevia" (JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis*, Liber I, q. 13, ed. STREIJGER, BAKKER, p. 138, ll. 1-2), and "quia oportet esse alterationem praeviam (i.e., before corruption)" (*ibid*., p. 140, l. 4).

temporally extended structure of the alteration that, in Buridan's view, prepares corruption and, therefore, substantial change.

It is on the basis of this argument that Buridan, in the *conclusiones* of the *quaestio*, proceeds to reject the existence of "absolute" *minima secundum corruptionem* in homogeneous material substances (in a passage where Burley's influence is, again, clear):

> The second conclusion is that there is so small a quantity that below such or a smaller one a body cannot be preserved in a natural way [i.e., according to the ordinary course of nature] on its own separately from other [substances] of its species for a long and significant time (*longo et notabili tempore*), but continually it would tend to corruption and suddenly it will be corrupted by the bodies proximate to it. The reason is because, from the fact that those proximate bodies would not be of the same species with that, they would have some contrariety with it, through which they would be corruptive of that, if it were of a too weak resistance; and that could be so small that it would be of a too weak resistance to resist [to the proximate bodies] for a significant time[629].

Buridan's idea is therefore that given any portion of a homogeneous material substance, however small, the corruption by the containing medium (by the substances surrounding it more generally) necessarily takes time, insofar as it must be preceded by a preparing

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[629] JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis*, Liber I, q. 13, ed. STREIJGER, BAKKER, p. 139, ll. 3-10: "Secunda conclusio est quod sic est dare parvam quantitatem quod sub tali vel minori non potest naturaliter aliquod corpus seorsum ab aliis de sua specie salvari longo et notabili tempore, sed continue tenderet ad corruptionem et cito corrumperetur a corporibus sibi propinquis. Causa est, quia ex quo illa corpora propinqua non essent eiusdem speciei cum illo, ipsa haberent ei aliqualem contrarietatem, per quam essent corruptiva illius, si esset nimis debilis resistentia; et illud posset esse ita parvum quod nimis esset debilis resistentia ad resistendum tempore notabili." The corresponding passage in the *prima* or *secunda lectura* reads as follows: "Sed circumscripta potentia divina (*sed…divina om*. T) sit tertia conclusio quod (T; *om*. C) non est dare minimam carnem vel minimam aquam et de aliis que possunt naturaliter seorsum et divisim ab alia carne vel ab alia aqua subsistere, quia si detur talis minima caro, ipsa habet aliquantam resistentiam, aliter non posset seorsum subsistere (T; *accipere* C). Et constat quod sicut ipsa est composita ex partibus, ita resistentia illa est composita ex resistentiis partium, propter quod quelibet pars eius habet etiam aliquantam resistentiam. Ideo si ista caro divideretur non statim in instanti corrumpentur partes propter quod quelibet pars aliquo tempore maneret caro vel aqua licet seorsum. Igitur ista primo modo accepta que ab adversario dicitur minima non erat minima que seorsum posset subsistere. Et ad idem valebat (T; *vut* C) ratio que prius fiebat quod omnem corruptionem rei debet precedere alteratio que est quinta ; modo (que est quinta modo] *quia non corrumpitur res sine alteratione precedente aut concomitative, et est* T) alteratio est temporalis, ideo aliquo tempore iste partes remanerent (*durarent* T) licet separarentur" (C, f. 12va, T, f. 15va-b). Note that here the connection of the conclusion with the argument inspired by Burley is made explicit. Later on, the same idea (without the explicit recourse to the argument inspired by Burley) is restated as follows: "Secunda conclusio est quod (T; *om*. M) est dare ita parvam aquam vel carnem quod ipsa seorsum non posset diu manere, ymmo continue tenderet ad corruptionem, scilicet propter contrarietatem contingentis et debilitatem sue resistentie" (C, f. 12vb, T, f. 15vb). The corresponding passage in the *tertia lectura* reads as follows: "Dico etiam quod Aristoteles intendit (*dicit enim Aristotelis quod* V) quod est ita parva quantitas quod nullum corpus naturale possit salvari sub ea seorsum longo tempore, ita quod esset dare ita parvam carnem, vel ita parvam aquam, quod si ipsa esset seorsum ab alia aqua, ipsa continue tenderet ad corruptionem et cito corrumperetur a continente" (V, f. 13ra, E, f. 7ra, K, f. 14a).

alteration, and insofar as during such alteration the substance undergoing corruption tries to resist to it.

The notion of the resistance exercised by the substance undergoing corruption also allows Buridan to draw another conclusion based on the relation between the relative strength of the power of the corrupting medium and of that of the substance undergoing corruption:

> The third conclusion is that, given a passive [i.e., the substance undergoing corruption] having a resistance, there is some quantity so small that no corporeal agent under that quantity or a smaller one can by itself act on that [so as to corrupt it], because there can be so small a quantity of an active [power] that the active power would not exceed the resistance of that passive [power][630].

In this passage it is easy to see Buridan explicitly developing a reflection already present in Burley's last *Physics* commentary, namely, the reflection according to which any *minimum secundum corruptionem* is relative to the strength of the passive power of the substance undergoing corruption and to that of the active power of the containing medium (although Buridan does not attempt to quantify such strengths, as Burley had done in a rudimentary way). More than this, Buridan also explicitly hints to the fact that, given a certain strength of the passive power of the substance undergoing corruption, it is always possible to find a corresponding strength of the active power that is insufficient to corrupt a substance with such a passive power. Such a substance, on this model, would therefore come to constitute what Burley called a *minimum circonstantionatum*.

Still, Buridan is evidently unsatisfied with basing his claim that the corruption of an extremely small portion of a material substance by the containing medium is a process happening through an extended interval of time merely on the fact that any such corruption is necessarily preceded by a temporally extended alteration. Indeed, Buridan

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[630] JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis*, Liber I, q. 13, ed. STREIJGER, BAKKER, p. 139, ll. 17-20: "Tertia conclusio est quod dato passo habente resistentiam est aliqua sic parva quantitas quod nullum agens corporeum sub illa quantitate vel minori posset seorsum agree in illud, quia sic posset esse parva quantitas activi quod virtus activa non excederet resistentiam illius passivi." The corresponding passage in the *prima* or *secunda lectura* reads as follows: "Tertia conclusio est quod dato aliquo certo passivo habente tamen resistentiam, esset dare ita parvum activum quod nihil posset agere in illud passivum, quia posset dari ita parvum quod eius virtus non excederet virtutem resistentie, et sic non posset agere" (C, f. 12vb, T, f. 15vb). The corresponding passage of the *tertia lectura* reads as follows: "Aristoteles etiam intendit quod, dato aliquo passivo habente resistentiam, esset dare ita parvum activum quod non posset agere in illud passivum; sic intendit Aristoteles virtutes activas esse determinatas ad minimum" (V, f. 13ra, E, f. 7ra, K, f. 14a).

is conscious of the fact that such an argument loses most of its strength if, differently from Burley, corruption is thought of as a process separated from (albeit intimately connected to) that of its preparing alteration.

This is why, in the *ultima lectura*, Buridan, after having posited all the *conclusiones* of the *quaestio*, inserts a final *dubitatio*, *Utrum sit dare corpus naturale seorsum existens modo praedicto, quod sic sit minimum quod impossibile sit corpus de sua specie similiter seorsum existens esse minus*. This *dubitatio* is therefore explicitly aimed at discussing again the notion of "absolute" *minima secundum corruptionem*. It is in this context that Buridan bases the rejection of such a notion on a different argumentative strategy than the one loosely inspired by Burley. Indeed, in this context Buridan adopts a strategy grounded upon what I have called the "piecemeal" view of substantial change. Buridan's presentation of this view in the context of his criticism of the notion of "absolute" *minima secundum corruptionem* is inserted in the following passage, where, interestingly, such a view is presented as an argument that reinforces the one loosely inspired by Burley, rather than entirely replacing it (although, ultimately, it is clear that the argument based on the "piecemeal" view of substantial change is the decisive one on which Buridan's criticism relies):

> Some (*aliqui*)[631], indeed, say with good probability (*probabiliter*) that in this way [i.e., in terms of *minima secundum corruptionem*] it is not possible to have a *minimum*. For instance, there is no minimal flesh in this sense on its own [separate] from every existing flesh, such that no smaller flesh could be given also existing on its own [separate] from every flesh. And this is proved because: such as it was argued before, that flesh is divisible, given that it has a part distinct from another part (*pars extra partem*); and if it is divided, the parts upon division are not corrupted instantaneously, because it is necessary that there is a previous alteration and because any part whatsoever has a certain resistance that it is necessary to eliminate before that all of it is corrupted. And this, moreover, is confirmed because: if a fire, however small, were in the depth of the sea, nothing else could be generated from it, such as water or air, if before its matter were not disposed through a previous alteration to take on the form of air or water: and that [fire] would not be corrupted, if nothing else were generated from it. But, moreover: because a natural agent, all things equal, acts in a stronger way on what is closer to itself than on what is further [from itself], therefore the external parts of that fire in contact with the containing and corrupting water would be altered in a stronger and faster way by that water than the middle part [of the fire]. And because of this those external parts are more quickly disposed

[631] It is extremely tempting to interpret this as an implict reference to Burley, albeit, of course, Burley's position is presented by Buridan according to his own reinterpretation of it, that is, as based on the idea of an intimate connection between alteration and corruption, not, however, on that of corruption as the inclusive limit of alteration.

> in a sufficient way to the generation of another form and to the corruption of the form of fire then the middle part [of the fire]. And because of this those extreme parts are more quickly corrupted than the middle part. Therefore after that [moment] the middle part still remains fire which exists in separation from any other fire, given that, indeed, it is smaller than it was the fire which you took as *minimum* if the part is smaller than the whole [to which it belongs][632].

Buridan's argument is clear: it is true that corruption happens instantaneously, yet no three-dimensional entity, as any extended portion of a material substance existing on its own, however small, is supposed to be, can be corrupted all at once. Indeed, the containing medium first corrupts the parts of such portion of a material substance located onto its surface, and only at a later stage can it corrupt the parts located inside it. Given that this process of corruption happens over a continuous interval of time, it is always possible to identify a part of a substance smaller than the *minimum naturale* that exists on its own for a period, however small, of that interval of time, so that the very notion of *minimum secundum corruptionem* loses its meaning. No "absolute" *minima secundum*

[632] JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis*, Liber I, q. 13, ed. STREIJGER, BAKKER, p. 139, l. 28-p. 140, l. 19: "Aliqui enim dicunt probabiliter quod sic non est dare minimum. Verbi gratia non est sic dare minimum carnem seorsum ad omni alia carne existentem, quin posset esse caro minor etiam seorsum ab omni alia carne existens. Quod probatur quia: sicut prius arguebatur, illa caro est divisibilis, cum habeat partem extra partem; et si dividatur, partes apud divisionem non in instanti corrumpuntur, quia oportet esse alterationem praeviam et quia quaelibet pars habet aliquantam resistentiam quam prius oportet remitti quam esse totam corruptam. Et hoc iterum confirmatur quia: si quantumcumque parvus ignis esset in profundo maris, non posset ex eo generari aliud, scilicet aqua vel aer, nisi prius materia eius disponeretur per alterationem praeviam adsuscipiendum formam aeris vel aquae; et ille non corrumperetur, nisi aliud inde generaretur. Sed ultra: quia agens naturale ceteris paribus agit fortius in sibi propinquius quam in remotius, ideo partes exteriores illius ignis immediatae aquae continenti et corrumpenti fortius sive velocius alterantur ab illa aqua quam pars media. Propter quod partes illae exteriores citius sunt sufficienter dispositae ad generationem alterius formae et ad corruptionem formae ignis quam pars media. Propter quod citius corruptae sunt illae partes extremae quam media. Ideo post illud pars media adhuc manet ignis ab omni alio igne separatim existens, cum tamen sit minor quam esset ignis quem cepisti tamquam minimum, si pars sit minor toto." The corresponding passage of the *tertia lectura* reads as follows: "Sed dico quod adhuc illa conclusio [i.e., quod in nullo corpore naturali (*materiali* V) generabili vel corruptibili est dare minimum potens seorsum existere] haberet veritatem loquendo naturaliter et circumscripto miraculo; quia si daretur aqua minima secundum adversarium, illa esset divisibilis quia haberet partem extra partem, et si divideretur, non statim in instanti esset corrupta forma aque, propter hoc, ut dicebatur prius, quod corruptio indigeret alteratione precedente et quod (V, C; *om*. E) forma aque quantumcumque parva habet aliqualem (*aliquam* V) resistentiam. Item ponamus quod illi minime aque sit applicatum corrumpens, tamen illud corrumpens non tangeret illam aquam secundum omnes partes eius nisi esset penetratio corporum, que est impossibilis; igitur illud corrumpens esset proximus uni parti illius aque quam alteri, ideo illam partem propinquiorem prius alteraret et prius corrumperet quam aliam partem. Et sic post corruptionem prime partis adhuc alia pars esset aqua et esset minor quam erat tota, igitur esset dare minus minimo, quod esset impossibile" (V, f. 12va-b, E, f. 7ra, K, ff. 12b-13a). The situation is, however, different in the text of the *prima* or the *secunda lectura*, where a corresponding passage is entirely absent, pointing to the fact that Buridan's "piecemeal" view of substantial change was likely developed after this redaction of the *Quaestiones*.

corruptionem can, according to Buridan, be identified in homogeneous material substances.

The implicit premiss of Buridan's argument (a premiss which, however, Buridan makes explicit in other passages of his Aristotelian commentaries), the one that grounds his innovative, "piecemeal" understanding of the corruption of extremely small portions of a homogeneous material substance existing on their own (and of the substantial change of homogeneous material substances more generally), is a belief in the idea that the substantial forms of homogeneous material substances (such as those of heterogeneous substances, save for the intellective soul) are spatially extended entities, having (actual) quantitativee parts which are co-located with the quantitative parts of the matter they inform[633]. This aspect of Buridan's metaphysics and natural philosophy, while generally acknowledged, has not been the subject of extensive studies, differently, for instance, from what happened to Ockham's similar view, from which, possibly Buridan was influenced in this respect (although nowhere in the text does Buridan make reference to Ockham).

The consequence of this view is that substantial change can be understood as a continuous process in a much stronger way than it was in Burley. Indeed, if the substantial forms of inanimate homogeneous substances are spatially extended entities having quantitative parts co-located with the quantitative parts of the matter they inform, then such substantial forms have the same mereological structure of a continuous magnitude, and, as such, their generation and corruption, for any extended portion of the matter that they inform, is necessarily a continuous process, happening "part after part", so to

[633] Cf., for instance, IOANNES BURIDANUS, *In Metaphysicen Aristotelis questiones argutissimae Magistri Ioannis Buridani in ultima praelectione ab ipso recognite [...]*, Parisiis 1518, Liber VII, q. 14, f. 49va, quoted in LAGERLUND, *Material Substance*, *op. cit.*, p. 477: "One can imagine many ways in which there are a plurality of substantial forms. In one way through a quantitative division of forms. In this way a part of a form is a form, and therefore it follows that in every composite substance there are infinite partial substantial forms as well as infinite parts of matter, unless of course we are talking about a human being whose form is not extended and not divisible." Note that Lagerlund's chapter also remarks that this conception of substantial forms has consequences for Buridan's conception of substantial change, without, however, articulating them in detail: "This view [Lagerlund is here referring more directly to the doctrine of persistence of material substances that Buridan derives from his conception of substantial forms] will have a problem accounting for substantial change. In fact, all change seems to be a form of alteration" (*ibid*.). I take it that what Lagerlund means here is that, on this view, all substantial change will have to be a temporally extended process. Nevertheless, the term 'alteration' might be misleading, given that, as I will show below in the main text, Buridan is extremely clear in explaining that, according to his view, substantial change is not a gradual process (i.e., a process taking place through degrees).

speak[634]. According to Buridan, therefore, it is only *because* the substantial forms of inanimate homogeneous substances have this mereological structure that the generation and corruption of any extended portion of the matter that they inform is a process taking place through an extended interval of time, each instant of which corresponds to the corruption of one (or more) minimally extended parts of such substantial forms. This is what I call the "piecemeal" conception of substantial change.

As Buridan himself puts it in one redaction of his *Quaestiones* on the *De generatione*:

> When it is asked whether every substantial change is instantaneous, I answer in the negative, because generation is called 'instantaneous' when the whole is acquired at once (*simul*), not one part after another. Now, many substances are brought about continuously, one part after another, such as if water is transformed in air, it is not all transformed at once. Hence, even though there is no succession according to graduated parts (*per partes graduales*) [i.e., degrees], because substance does not admit of more and less [Aristotle, *Categories* 5, 3b32-33], nevertheless there is indeed a succession according to quantitative parts (*per partes quantitativas*). If, however, an indivisible substance, such as the intellective soul, were generated or created, that generation would be called 'instantaneous'.[635]

In the passage, Buridan clarifies the notion of 'succession' implied by a temporally extended substantial change *per partes quantitativas* (i.e., the notion of succession implied by the "piecemeal" view of substantial change) by comparing it with the notion of 'succession' implied by a temporally extended substantial change *per partes graduales*. This latter conception of substantial change, that Buridan firmly rejects, but that had sometimes been advocated by previous commentators[636], is a conception based

[634] To be clear, since Buridan's belief that substantial forms (apart from the intellective soul) are spatially extended entities having quantitative parts co-located with the parts of the matter they inform concerns both homogeneous and heterogeneous forms (save for the intellective soul), in principle there seems to be no reason to deny that the innovative view of substantial change he develops and taking its point of departure in that belief concerns both homogeneous and heterogeneous substances (save for man). Nevertheless, lacking any positive textual evidence for what concerns heterogeneous substances, I will limit my discussion to homogeneous ones, especially since they are the focus of the thesis.

[635] JOHN BURIDAN, *Quaestiones super libros De generatione et corruptione Aristotelis*, Liber I, q. 6, ed. STREIJGER, BAKKER, THIJSSEN, p. 71, ll. 19-28: "Quando quaeritur utrum omnis transmutatio substantialis est instantanea, respondeo quod non, quia generatio instantanea dicitur quando totum simul acquiritur, non pars post partem: modo multae substantiae fiunt continue pars post partem, ut si aqua resolvitur in aerem, non tota simul resolvitur. Unde quamvis non sit successio secundum partes graduales, propter hoc quod substantia non suscipit magis et minus, tamen successio est bene secundum partes quantitativas. Si tamen aliqua substantia indivisibilis, sicut anima intellectiva, generetur aut creetur, illa generatio aut creatio dicetur instantanea."

[636] A conception broadly along these lines had, for instance, been advocated by Roger Bacon, as mentioned above.

on the idea that substantial forms have degrees of intensity just as accidental forms have. For instance, a concretely instantiated substantial form of fire can be more or less fire than another concretely instantiated substantial form of fire, such as a concretely instantiated accidental form of whiteness can be more or less white than another concretely instantiated accidental form of whiteness. Once this idea (that Buridan firmly rejects) is accepted, it follows that the corruption of the substantial form of a homogeneous material substance as a whole happens progressively, because, before the substantial form at hand (say, that of fire) can be corrupted, it has to go through various degrees of decreasing intensity (exactly as it happens in the case of the alteration of an accidental form, such as that of whiteness). In the passage above Buridan wants to stress that the notion of 'succession' implied by a temporally extended substantial change *per partes quantitativas* is different from this notion of 'succession'. In a temporally extended substantial change *per partes quantitativas*, indeed, the temporal succession does not depend on the fact that all the parts of the homogeneous material substance considered undergo corruption together (i.e., during the same interval of time), but rather depends on the fact that some parts of the homogeneous material substance considered are corrupted at a given instant of time, others at a different instant of time, and so on until the substance is entirely corrupted and a new substantial form is generated in all of its parts[637].

Nevertheless, what is important to remark here is that in a substantial change that is successive *per partes quantitativas*, according to Buridan, there is no single instant to which the substantial change can be reduced. All the time required to corrupt the parts of a given homogeneous material substance, from the outermost ones to the innermost ones, is part of the substantial change of that substance. It goes without saying that, if the process is not completed, i.e., if the action of the external agent is interrupted before it has corrupted all the parts of the substance considered, then no substantial change at all has taken place. Simply put, the original homogeneous material substance has lost some of its parts and has therefore been reduced in size.

[637] It is true that Buridan applies his "piecemeal" view of substantial change primarily to corruption. Nevertheless, there seems to be no reason to deny that the view applies in the same way to generation as well (as I have assumed above). Moreover, this is stated in very clear terms by Albert of Saxony, who, as I will show below, adopts Buridan's same conceptual model of the temporal structure of substantial change.

Buridan is of course aware of the fact that the "piecemeal" view of substantial change stands in stark contrast to Aristotle's recurring contrary statement that the corruption of a material substance by a contrary one happens for all of it at together[638]. Nevertheless, in the *ultima lectura* he puts forth an ingenuous explanation to show how such a statement can be made compatible with his own view:

> And Aristotle's statement that a whole must be altered and frozen together (*simul*) [cf. *Physics* VIII.3, 253b23-26, which Buridan evidently takes to apply equally well to substantial change as to alteration] and not first its half can be glossed [by saying] that this is true dividing the alterable [substance] according to the division of the surface alone, i.e., according to the longitude or latitude of the surface according to which the agent touches the patient, because in this way a body can touch another one according to any of its parts together, and so [it can] act together on any of its parts, not on one before another one. But if division happens according to depth or to the third dimension, then one body does not touch another one according to all of its parts, but only according to one; therefore it acts before, and in a stronger way, on that [part], and through that subsequently on another one, since it is necessary that the action of a body on [another] body happens by contact[639].

According to Buridan, therefore, Aristotle's statements concerning the instantaneous nature of substantial change apply exclusively to the two-dimensional surface of three-dimensional homogeneous material substances, which is the maximal portion of a homogeneous material substance which can be corrupted together, so to speak (provided that each of its parts is in contact with a corresponding one of the corrupting agent, whatever the mereological structure of the agent's substantial form), not to three-

[638] Buridan quotes, in this respect, *Physics* VIII.3, 253b23-26, together with Averroes' gloss on it the *Long Commentary* on the *Physics* (cf. AVERROES CORDUBENSIS, *Aristotelis Stagiritae de physico auditu libri octo, cum Averrois Cordubensis variis in eosdem commentaris*, Venetiis 1562, f. 359I) and *De sensu et sensato* 6, 446b28-447a3.

[639] JOHN BURIDAN, *Quaestiones super libros Physicorum Aristotelis*, Liber I, q. 13, ed. STREIJGER, BAKKER, p. 141, l. 18-p. 142, l. 4: "Et posset glossari dictum Aristotelis quod contingit totum alterari ut congelari simul et non medium prius, quod hoc est verum dividendo alterabile secundum superficialem divisionem solum, scilicet secundum longitudinem vel latitudinem superficiei secundum quam agens tangit passum, quia sic unum corpus potest tangere alterum secundum quamlibet partem eius simul et sic simul agere in quamlibet partem eius, non prius in unam quam in aliam. Sed si fit divisio secundum profunditatem seu trinam dimensionem, tunc unum corpus non tangit alterum secundum omnes eius partes, sed solum secundum unam; ideo prius et fortius agit in illam et mediante illa consequenter in aliam, cum necesse sit actionem corporis in corpus fieri per contactum." No equivalent passage trying to provide a consistent interperation of Aristotle's belief in the simultaneity of substantial change for any given patient can be found in the *prima/secunda* or in the *tertia lectura*, although, as mentioned above, the *tertia lectura* refers rather clearly to the idea that two bodies cannot touch each other in all their three dimensions, "nisi esset penetratio corporum, que est impossibile" (cf. *supra*).

dimensional portions of them (else the fundamental Aristotelian principle of the impenetrability of bodies, to which Buridan firmly adheres, would be violated).

The true novelty of Buridan's discussion of *minima naturalia*, and, more specifically, of *minima secundum corruptionem*, is, therefore, his insertion into the debate of the "piecemeal" view of substantial change (and, more specifically, of the process of corruption of any tridimensionally-extended portion of a material substance). By having recourse to this view, Buridan is therefore able to ground the rejection of "absolute" *minima secundum corruptionem* on an argumentative strategy different from Burley's one, although it is clear that the two discussions ultimately rejoin each other in making not only any "intrinsic" notion of *minima naturalia* in homogeneous material substances vanish, but also any "extrinsic" notion of *minima naturalia*. At most, one could only admit the existence of what Burley had called a *minimum circonstantionatum*, which, however, is not a *minimum naturale*, but, rather, the minimal quantity of matter of a given homogeneous material substance that is strong enough to resist to a corrupting action of a containing medium of a certain intensity.

2.12.4. Nicole Oresme (and Albert of Saxony): Systematising a New Understanding of *Minima secundum corruptionem*

The "piecemeal" view of substantial change (or, at any rate, the idea that the corruption of extremely small threedimensionally-extended portions of homogeneous material substances existing on their own happens in a "piecemeal" way) was not only endorsed by Buridan, at the Parisian Faculty of Arts around the middle of the 14th century. Indeed, it also features prominently in Nicole Oresme's *Physics* commentary (and specifically in its discussion of *minima naturalia*). Nicole Oresme (ca. 1320-1382) was an eminent philosopher, mathematician, and even economist, serving as Master of Arts, and then of Theology, at Paris and, from 1362 onwards, as member of the *entourage* of the *dauphin*, then king of France, Charles V, before being elected bishop of Lisieux in 1377. His *Physics* commentary is a work preserved in a single manuscript witness and likely to be dated before 1347, according to its editors[640].

[640] The work has been critically edited as NICOLE ORESME, *Quaestiones super Physicam (Books I-VII) (Studien und Texte zur Geistesgeschichte des Mittelalters 112)*, edited with Introduction and Indices by S.

Still, Oresme's discussion of *minima naturalia*, contained in q. 10 on Book I of the commentary, *Utrum in qualibet specie sit dare minimum naturale, verbi gratia ut minimus homo et caro vel aliquod tale*, takes a very different methodological approach from Buridan's corresponding discussions. Indeed, Oresme (as Albert of Saxony and other commentators will also do), took advantage of a wealth of previous debates (among which also Scotus' distinction between the issue of *minima naturalia* and that of the *minima materia* plays a central role) in order to set forth a complete and exhaustive scheme of all the cases involved in the analysis of *minima naturalia*. Such an all-encompassing classificatory scheme certainly represents one of the most important elements of the (late) 14th-century intellectual heritage concerning the issue of *minima naturalia*, although, of course, it does not add much in terms of novelty of arguments and conclusions[641].

More specifically, Oresme starts his discussion of *minima naturalia* by noting that to discuss *minima naturalia* one has first to set out some important distinctions concerning the word *naturalia*.

1. First, one must distinguish between two different kinds of material substances, i.e., simple ones (the elements) and those which are composed of these simple ones. The latter group is then subdivided by Oresme into inanimate (imperfect) entities, such as wood and stones, and animate (perfect) entities, such as animals and, in particular, man.
2. A second distinction which crosses the previous one is that between homogeneous and heterogeneous substances.
3. Finally, Oresme notes – presumably due to his peculiar conception of accidents – that the issue of *minima naturalia* applies to them as well, implicitly hinting at the issue of *minima sensibilia*. It is, indeed, one of the peculiarities of Oresme's

CAROTI, J. CELEYRETTE, S. KIRSCHNER, E. MAZET, Leiden-Boston, MA, Brill, 2013. Concerning the dating of the work see *ibid*., Introduction, pp. XXIV-XXV. For a useful presentation of the structure and the main contents of Oresme's *Physics* commentary, based on the new critical edition and considered in the wider context of Oresme's overall thought, see J. CELEYRETTE, *Les Questions sur la* Physique *dans l'œuvre de Nicole Oresme*, in J. CELEYRETTE, C. GRELLARD (eds.), *Nicole Oresme philosophe. Philosophie de la nature et philosophie de la connaissance à Paris au XIVe siècle (Studia Artistarum 39)*, Turnhout, Brepols, 2014, pp. 63-82.

[641] The fact that Oresme's taxonomy of *minima naturalia* is far closer to late 14th-century ones than Buridan's provides an additional reason to discuss Oresme's *Physics* commentary after Buridan's ones.

approach to *minima* to discuss *minima naturalia* and *minima sensibilia* as "twin" issues. To put it in other words, the solution to one of them inevitably applies also to the other one[642].

A second group of distinctions introduced by Oresme is that which concerns the notion of *minima* itself. This distinction is directly motivated by Oresme's decision to subsume under an overarching category *minima naturalia* and *minima sensibilia*. Oresme notes, indeed, that *minima* can be understood as referring both to the accidental division of substances according to the division of matter (what Oresme calls *minima in extensione*, or *in quantitate*, and which are what I call *minima naturalia* and *minima sensibilia* proper) and as referring to the formal division of accidents according to their intensity (what Oresme calls *minima in intensione*)[643]. This second category, evidently, does not apply to substantial forms, but it has an important bearing on the discussion of the division *per se* of sensible qualities at least since Buridan, on whom Oresme *might* be relying here. Indeed, as mentioned in the general Introduction to the thesis, Buridan's discussion of the *intensio* and the *remissio* of accidental forms with respect to the issue of the *numerus sensibilium* in (one version of) his *Quaestiones* on the *De sensu* opens up a new path for Late Medieval commentators discussing the issue of *minima sensibilia* (and of hylomorphic *minima tout court*), and Oresme seems to be one of the first commentators to explore it further. This issue, however, will be discussed in Chapter 4 of this thesis. Finally, Oresme explicitly distinguishes the two issues of *minima naturalia* and of the *minima materia*[644].

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[642] NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 72, ll. 25-31: "Prima distinctio est de ente naturali, quod 'naturale' dicitur de substantia et accidente et substantia quedam est materia et quedam est forma, que dicitur naturalis et etiam natura. Alia est composita; compositarum aliud est elementum simplex, aliud mixtum imperfectum inanimatum, ut lignum, lapis, aliud <perfectum> animatum, ut homo, equus. Iterum, alia sunt homogenia, alia heterogenea. Accidentia sunt naturalia, sicut qualitates prime."

[643] NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 72, ll. 32-39: "Secunda distinctio de minimo: <minimum> potest ymaginari in extensione <sive> in quantitate, vel in intensione, sicut si esset qualitas remississima, et in potentiis et in virtutibus, et sic de aliis. Sed non omnia pertinent ad illud propositum, immo primo *Celi* quoad hoc determinatur de potentiis activis et passivis; ideo de isto articulo quero hic modo: 'utrum respectu cuiuslibet forme sit materia ita parva quod illa forma non posset esse sub minori nec etiam aliqua eiusdem speciei, sicut forma hominis vel aliqua talis'."

[644] NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 72, ll. 40-41: "Adhuc est tertia distinctio, quia questio potest intelligi vel quantum ad generare vel quantum ad permanere tempore sensibili."

Given the abovementioned distinctions, Oresme's solution to the issue of *minima* distinguishes four subcases. For what concerns, first of all, the forms of animate entities (and Oresme takes Aristotle to be talking of them, when he discusses the cases of flesh and bone in *Physics* I.4, i.e., the forms of flesh and bone insofar as they are parts of a living being), Oresme is clear: such forms have both a *minima materia* required for their (instantaneous) generation (as demonstrated by the case of the embryo[645]) and a (smaller) *minimum* below which the hylomorphic compounds concerned are instantaneously corrupted[646]. This solution is not unusual, and indeed, as seen, most previous commentators tended to assume that the issue of *minima naturalia* only becomes problematic when one discusses (homogeneous) inanimate substances, such as wood or stones. The whole issue of the existence of *minima naturalia* (and of a *minima materia*) in animate entities is, however, framed by Oresme in terms of the minimal quantity required for the existence (or for the persistence) of the forms of animate substances and of the maximal quantity under which the forms of animate substances cannot be generated or persist[647]. This attention to limit-decision problems is a typical feature of most 14th-century commentaries on the issue of *minima* (and *maxima*) *naturalia*. Yet, insofar as this

[645] This particular example, however, depends on Oresme's peculiar conception of the duality of the substantial form of human beings. This issue, discussed especially in the *Quaestiones De anima*, has first been brought to the attention of modern scholars by Peter C. Marshall in 1980 in his Ph.D. thesis, P. MARSHALL, *Nicholas Oresme's* Questiones super libros Aristotelis De anima*: A Critical Edition with Introduction and Commentary*, Ph.D. thesis, Ithaca, NY, Cornell University, 1980, and very briefly discussed in Benoît Patar's introduction to the 1995 critical edition of the *Expositio et Quaestiones in Aristotelis De anima* (NICOLAUS ORESME, *Expositio et Quaestiones in Aristotelis De anima (Philosophes médiévaux 32) (2 vols.)*, ed. B. PATAR, études doctrinales en collaboration avec C. GAGNON, Louvain-la-Neuve-Leuven, Institut Supérieur de Philosophie-Peeters, 1998). More recently, Jack Zupko has also discussed the topic in J. ZUPKO, *Nicole Oresme, Dualist*, in F. AMERINI, S. FELLINA, A. STRAZZONI (eds.), *Quaderni di Noctua* 5, 2019, pp. 433-465.

[646] Incidentally, Oresme also believes that the *minima materia* required for the generation of different (animate) substances varies in size, and he interestingly puts forth the view that it might also vary among different individuals of the same species: "Et ex hoc sequitur incidenter quod aliqua est quantitas minima materie respectu forme hominis et respectu forme equi, et <sic> de aliis. Patet in secundo *huius* [cf. *Physics* II.2, 194a26-28] quod forma est finis materie, ideo una forma requirit maiorem materiam quam alia, sicut dicit Commentator primo *De anima* [cf. the *Long Commentary* on the *De anima*, I, text. 89] quod membra hominis non sunt alia a membris bovis nisi propter diversitatem anime. Et forte ista diversitas reperitur in eadem specie" (NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 73, ll. 73-78). Whether this also holds for their *minima naturalia* is open to question, but it seems likely that Oresme would agree with this idea.

[647] NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 73, ll. 55-58; p. 74, ll. 109-112: "Prima [conclusio] de formis perfectis animatis. Prima est quod, quantum ad generare, in talibus est dare minimum naturale, ita quod forma hominis vel asini potest generari in aliqua materia, et nullo modo potest in minori. […] Secunda conclusio est quantum ad durationem forme perfecte, et est quod est dare maximam quantitatem sub qua non potest durare, ita quod non potest sub illa nec sub aliqua minori, sed sub quacumque maiori, si non sit nimis magna vel extensa."

is an issue which does not have a substantial bearing on these commentators' conceptions of *minima naturalia*, I set it aside.

Getting now to the forms of inanimate entities, Oresme, first of all, claims that there is no *minima materia* which is required for their generation[648]. Interestingly, the reason for this firm belief is the acceptance of the idea (that grounds, as seen in Buridan, the "piecemeal" view of substantial change) according to which the substantial forms of homogeneous material substances are spatially extended entities having quantitative parts co-located with the matter they inform. Insofar as the substantial form of such substances has quantitative parts of this kind, so Oresme argues, it is introduced into matter in a progressive way, and therefore the matter required for their generation is (potentially) infinitely divisible, and so is the time through which generation occurs[649]. This passage is extremely relevant insofar as it shows that not only Oresme has a "piecemeal" understanding of *minima secundum corruptionem* (as it will appear below), but that he also has a "piecemeal" understanding of the generation of homogeneous material substances, an understanding which he uses in connection with the issue of *minima materia*, an aspect that is absent from Buridan's discussions.

When it comes to the issue of the *minima naturalia* proper of homogeneous material substances, Oresme presents a more nuanced scheme than the one introduced by Buridan, one which shows clearly that Oresme was reaching back directly to Burley (or, in any case, to the same arguments presented by him):

> But for what concerns the duration [of the forms of homogeneous material substances] [the issue] can be understood in two ways: in one way, [as meaning] that something of that sort [i.e., a homogeneous substance], such as it would be a drop of water, while it lasts, it prevails over the contrary [medium] that surrounds it, and that it is stronger or equally strong in resisting such as that [i.e., the containing medium] is at corrupting [it]. In another way [as meaning] that the contrary [medium] surrounding it prevails and acts [to corrupt it]; and then it is said that water lasts while it tends to corruption[650].

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[648] NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 76, ll. 163-165: "Nunc dicendum est de formis imperfectis. Prima conclusio est quod quantum ad generationem non est dare in eis minimum naturale, quia possunt introduci in materia quantumcumque parva."

[649] NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 76, ll. 165-169: "Ratio est quia per secundam suppositionem generantur successive per partes materie; et patet ad sensum de ig<n>e. Et ideo forma ignis prius introducebatur in medietate stuppe quam in toto; et ita de medietate medietatis, et sic sine fine."

[650] NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 76, ll. 170-175: "Sed quantum ad durationem potest intelligi dupliciter: uno modo, quod aliquid

The passage presents a perfect correspondence with the two cases distinguishes by Burley in discussing *minima secundum corruptionem*, which, however, in Oresme's version take on a specific terminology.

The first case in the passage, what Oresme identifies as the persistence of material substances *resistendo (contra corruptionem)*, is the case in which a material substance is capable of resisting to its surrounding medium, the case that, in Burley, identifies a *minimum naturale circomstantionatum* which is then to be analysed in terms of the numerical proportion of its passive power in connection with the active power of the containing medium (a kind of analysis, however, which does not take on a mathematical character in Oresme's commentary).

Oresme's position on *minima resistendo contra corruptionem*, indeed, as stated in the following passage, is rather in accordance with Burley's approach (which is also the one followed by Buridan in this respect):

> Then let it be the second conclusion that in such [material substances, i.e., homogeneous ones] it is possible to have a *minimum* according to the first understanding [i.e., a *minimum resistendo contra corruptionem*, or *minimum circonstantionatum*], not however in an unqualified way (*simpliciter*). For instance, there is a drop of water which is so small that it can last without tending to corruption in that medium for some sensible time, and none smaller [than it], and that is of such power to resist such as the surrounding [medium] to corrupt it; therefore it can last, and so if there were any smaller one whatsoever, then the surrounding [medium] would be stronger, and so it would tend to corruption, and as a consequence it [i.e., the first drop of water] would be minimal in that way[651].

Oresme's considered view is that *minima resistendo contra corruptionem* are those that, in any given condition, are (at least) equal in their passive power to the active power of the containing medium. Still, this "relative" understanding of *minima resistendo contra corruptionem* implies that there is no absolute *minimum secundum corruptionem* for any given inanimate material substance. Rather, the size of the *minimum* varies in direct

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tale, sicut esse gutta aque, dum durat, obtineat <supra> circa se circumstans contrarium, et quod sit fortior vel eque fortis ad resistendum sicut illud est ad corrumpendum. Alio modo quod contrarium circumstans obtineat et agat; et tunc dicitur durare aqua ten<d>endo ad corruptionem."

[651] NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 76, ll. 176-182: "Tunc sit secunda conclusio quod in talibus est dare minimum primo modo, non tamen simpliciter. Verbi gratia est aliqua gutta aque ita parva quod potest durare sine ten<d>ere ad corruptionem in illo medio per aliquod tempus sensibile, et nulla minor, et illa est tante potentie ad resistendum sicut circumstantia ad corrumpendum; ergo potest durare, et sic quantumcumque esset minor, tunc circumstans esse fortius, et ita ten<d>eret ad corruptionem, et per consequens esset minima illo modo."

proportion with the power of the containing medium[652]. That is to say, a minimum resistendo contra corruptionem is only a "relative" minimum naturale. But, even more than this, as it was for Burley and (according to a different argumentative strategy) for Buridan, portions of matter smaller than such minimum resistendo contra corruptionem can come to exist on their own, although for a short span of time. In this sense, therefore, a minimum resistendo contra corruptionem is not a proper minimum naturale.

The discussion concerning such smaller portions of matter is introduced by Oresme at the end of the last passage quoted above. Indeed, the second case in the passage, what Oresme calls the persistence of material substances *tendendo ad corruptionem*, is exactly the case that concerns the problem of the (potential) infinite divisibility of *minima secundum corruptionem* according to the (potential) infinite divisibility of the substantial form itself of the substance being corrupted. It is only in this second case, evidently, that the "ultimate" discussion of *minima secundum corruptionem* (both "absolute" and "relative") for homogeneous material substances can take place, and it is exactly at this point that Oresme, instead of resorting to Burley's view of corruption as the inclusive limit of alteration, decidedly turns towards the "piecemeal" view of substantial change (or, at the very least, of the process of corruption of extremely small three-dimensionally extended portions of homogeneous material substances existing on their own) shared by Buridan. Moreover, as Buridan, he uses it to ground the belief in the temporally extended structure of substantial change (at least for homogeneous material substances) and its consequences for the notion of "absolute" *minima secundum corruptionem*[653].

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[652] Cf. NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 76, l. 183-p. 77, l. 187: "Tertia conclusio est quod nulla est minima simpliciter primo modo nec etiam secundo modo. Prima pars patet, quia, licet illa gutta sit minima respectu illius medii, tamen una minor posset ita bene durare in medio minus contrario et minus forti ad corrumpendum, et adhuc alia minor in medio minus contrario, et sic sine fine."

[653] In Oresme's case, the rejection of Burley's thesis concerning corruption as the inclusive limit of alteration is even more explicit than in Buridan's one. See especially NICOLAUS ORESME, *Quaestiones super Physicam*, Liber II, q. 3, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 187, ll. 148-156: "Ultimum corollarium est quod accidens in virtute propria non producit aliquam formam, nec substantialem nec accidentalem, sed omnis <forma> principaliter est a substantia. Patet statim, quia <substantia> est agens disponens materiam et introducens formam, ut dicitur octavo *Metaphysice* [cf. *Metaphysics*, VIII.2, 1043a2-4]; modo per prece<de>ns corollarium accidens non potest dispondere nec alterare ex virtute sua. Bene tamen concedo quod est sicut instrumentum, et ideo reducitur ad causam efficientem, sed non agit proprie plus quam martellus dicitur percutere." As suggested to me by Sylavin Roudaut, in the case of Oresme (at least of his *Quaestiones* on the *Physics*) the rejection of Burley's view was made almost inevitable by Oresme's peculiar ontological conception of accidents as *modi rerum*. If accidents do not

It is thus in presenting his position on *minima tendendo ad corruptionem* that Oresme finally puts the "piecemeal" view of substantial change (or, at the very least, of the process of corruption of extremely small three-dimensionally extended portions of homogeneous material substances existing on their own) at the centre of the discussion. As Oresme states:

> The second part [of the conclusion] is clear, i.e., that there cannot be a minimal [drop of water] in those things that tend to corruption, because, such as the opposed form is generated successively according to the second supposition, so that is corrupted successively, such as it appears concerning fire and tow. And therefore there is no part so small that there cannot be a smaller one, and so on to infinity[654].

Oresme's argument could not be clearer: if substantial change is a process taking place part after part (and, therefore, over an extended interval of time), for any three-dimensionally extended portion of a homogeneous material substance, any part of such a portion of a homogeneous material substance, however small, comes to exist at least for an instant during the process of corruption itself, so that any notion of a *minimum naturale tendendo ad corruptionem*, i.e., of a proper ("extrinsic") *minimum naturale*, loses its meaning, as it was for Burley and for Buridan. Given a portion, however small, of a homogeneous material substance existing on its own taken to be its *minimum naturale*, a smaller one will come to exist during the process of corruption of what had been supposed to be the *minimum naturale* of the substance considered.

It might be objected at this point that the passage is too brief to demonstrate that Oresme's conception of the "piecemeal" view of substantial change (or, at the very least, of the process of corruption of extremely small three-dimensionally extended portions of homogeneous material substances existing on their own) is akin to that presented by Buridan in far more detail in his discussions on *minima naturalia*. Still, by looking closely at Oresme's discussion of *minima naturalia*, it appears clearly that the premiss on which the view is based, i.e., the idea that substantial forms (apart from the intellective soul) are spatially extended entities having quantitative parts co-located with the quantitative parts

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even have the ontological consistency of an (accidental) form, how could they alone be the cause of the corruption of a substantial form and of the generation of another one?

[654] NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 77, ll. 187-191: "Secunda pars patet, scilicet quod non est dare minimam in tendentia ad corruptionem, quia, sicut forma opposita generatur successive per secundam suppositionem, ita illa corrumpitur successive, sicut patet de igne et stuppa. Et ideo nulla est pars ita parva quin sit postea aliqua minor, et sic in infinitum."

of the matter they inform, is already present since the outset of the *quaestio* (even without considering the passage already referred to above in this respect), and so is the "piecemeal" view of the process of corruption of extremely small three-dimensionally extended portions of homogeneous material substances existing on their own stemming from it. Indeed, both elements feature quite clearly already in the second argument *quod non* of the *quaestio*:

> Secondly, [it is argued against the existence of *minima naturalia*] in this way: let A, therefore, be the smallest flesh (*minima caro*), to which let it be mixed a corrupting fire; and it appears that the fire will act first immediately in the part closer to it by burning [it], thus the other half will remain still uncorrupted after that, and then let the fire be taken away, so [the other half] can remain for a long time [under its substantial form]; then A was not the smallest flesh (*minima caro*).[655]

The example presented by Oresme (analogous to the one employed in the passage quoted above, concerning fire and tow) is structurally equivalent to the one used by Buridan in the *ultima lectura* of his *Quaestiones* on the *Physics*, namely, the thought experiment of the fire in the depth of the sea, although, while Buridan only considered elemental bodies in his own example, Oresme considers the case of a homogeneous mixed body being corrupted by an elemental one. This difference aside, the theoretical proximity between the two examples is significant, and it might point towards a common basis of discussion.

To all these considerations, one should also add that the belief that substantial forms (at least those of homogeneous material substances) are spatially extended entities having parts co-located with the parts of the matter they inform is not only present in q. 10 on Book I of Oresme's *Physics* commentary, i.e., the *quaestio* explicitly devoted to the discussion of *minima naturalia*; rather, it also explicitly features in other parts of Oresme's *Physics* commentary[656].

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[655] NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 71, ll. 10-14: "Secundo, sic: sit ergo *a* minima caro, cui commisceatur ignis corrumpens; et patet quod ignis aget prius immediate in partem sibi propinquam eam comburendo, igitur alia medietas stabit adhuc incorrupta post illam, et tunc extrahatur ignis, ita poterit diu stare, ergo *a* non fuit minima caro."

[656] Cf. especially NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 7 (*Utrum totum sit sue partes aut res distincta a partibus*), ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 54, ll. 213-216, where, in the context of a discussion of the numerical identity of (inanimate) homogeneous material substances, Oresme claims the following: "Ultima conclusio <est> quod in inanimatis non viventibus, *que habent formam extensam et diminuibilem* nec proprie augentur nec diminuuntur sicut viventia, in talibus per amotionem cuiuscumque partis est aliud totum." The emphasis is mine.

To all this, it must be added a fundamental final remark, one which distinguishes Oresme more sharply from both Burley and Buridan. As noted above, indeed, for Oresme the case of the accidental forms (of sensible qualities) is not different from that of substantial ones. This is why Oresme's solution to the issue of *minima naturalia* in homogeneous material substances is explicitly extended to *minima sensibilia*:

> Similarly it must be said concerning qualitative forms such as concerning imperfect substantial [forms], as it appears concerning heat and whiteness; and so about the others. And I always understand in the question [the case] of parts on their own separate from the whole [to which they belong], because about the other [ones] there is no doubt that in those there is a *minimum*[657].

No notion of *minima sensibilia* can be individuated in portions of material substances separated from the whole to which they belong. Unfortunately, Oresme never states whether he believes that, in the actual world, there could be sensible qualities existing on their own that are too small to be perceptible in act, and, in any case, he never details how he understands the ontology and the epistemology of "imperceptible" sensible qualities (even in case they would merely be considered a conceptual possibility). In this sense, the brief remark just quoted does not allow to infer a proper doctrine of *minima sensibilia*.

It is to be remarked, before closing this section, that the basic structure of Oresme's scheme (albeit without explicitly extending it to the case of *minima sensibilia*) appears to have been followed also by Albert of Saxony (ca. 1316-1390), Parisian Master of Arts by 1351, then founder and first Rector (from 1365) of the University of Vienna, and finally bishop of Halberstadt from 1366[658]. Moreover, Albert of Saxony certainly adopted the

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[657] NICOLAUS ORESME, *Quaestiones super Physicam*, Liber I, q. 10, ed. CAROTI, CELEYRETTE, KIRSCHNER, MAZET, p. 77, ll. 192-195: "Consimiliter est dicendum de formis qualitativis sicut de substantiis imperfectis, ut patet de caliditate et de albedine; et ita de aliis. Et semper intelligo in questione de partibus seorsum separatis a toto, quia de aliis non est dubium quod in eis est dare minimum."

[658] Albert discusses the issues of *minima materia* and *minima naturalia* together in q. 10 of his commentary on *Physics* I, which, significantly, is expliticly devoted to *minima materia* (*Utrum sit dare minimam materiam de cuius potentia potest educi forma naturalis*). Albert, indeed, takes this issue to have a conceptual priority over that of *minima naturalia*. The basic distinctions adopted by Oresme are also present in his *quaestio*, although in a simplified way. The only exception is the fact that Albert presents a complete scheme of "limit-decision" vocabulary (applying it specifically to the issue of *minima materia*), something that Oresme, while using the same vocabulary, did not do to the same extent: "Ante omnia primo videndum est de expositione istorum terminorum *minimum*, *maximum*, *minimum quod non*, *maximum quod non*. Unde *minimam materiam in qua potest aliqua forma generari* voco illam in qua potest et in nulla minore; *maximam* autem voco in qua potest et in nulla maiore; *minimam* autem *in qua non* voco illam in qua non, sed cuilibet minori, illa datur maior in qua fit; *maximam* autem *in qua non* voco illam in qua non, sed cuilibet maiori, illa datur minor in qua fit" (ALBERTUS DE SAXONIA, *Questiones super libros de physica auscultatione*; quoted from the new critical edition of the commentary, Liber I, q. 10, in B. PATAR (ed.), *Expositio et Quaestiones in Aristotelis Physicam ad Albertum de Saxonia attributae. Édition critique. Tome*

"piecemeal" view of substantial change, not only applying it to the issue of *minima naturalia* but also to that of *minima materia* (and applying it not only to homogeneous material substances, but also to heterogeneous ones apart from man), and enunciating it in such context in almost the same terms as those adopted by Buridan in the passage from one of his *De generatione* commentaries quoted above[659].

This combined evidence points to the conclusion that the "piecemeal" view of substantial change (or, at the very least, of the process of corruption of extremely small portions of homogeneous material substances existing on their own, separate from the whole to which they belong) had become the predominant approach to the issue of *minima naturalia* at the Parisian Faculty of Arts around 1350[660].

II, Louvain-la-Neuve-Louvain-Paris, Éditions de l'Institut Supérieur de Philosophie-Éditions Peeters, 1999, p. 146, ll. 76-83). For the influence of Buridan's *Physics* commentaries on Albert's one (and, to be more precise, given the chronological priority, for the influence of Albert's *Physics* commentary on Buridan's commentary *de ultima lectura*) see especially J.M.M.H. THIJSSEN, "The Buridan School Reassessed. John Buridan and Albert of Saxony", *Vivarium* 42 (1), 2004, pp. 18-42. Concerning the influence of Oresme's *Physics* commentary on Albert's one, see at least S. CAROTI, "Some Remarks on Buridan's Discussion on Intention and Remission", *ibid*., pp. 58-85, and J. SARNOWSKY, *Nicole Oresme and Albert of Saxony's Commentary on the* Physics*: The Problems of Vacuum and Motion in the Void*, in S. CAROTI, J. CELEYRETTE (eds.), *"Quia inter doctores est magna dissensio...". Les débats de philosophie naturelle à Paris au XIVe siècle (Biblioteca di* Nuncius *52)*, Firenze, Leo S. Olschki, 2004, pp. 161-174.

[659] The most explicit presentation of the "piecemeal" view is the one Albert provides while discussing the issue of minima materia in heterogeneous material substances (apart from man): "Tunc sit prima conclusio: forma asini vel alicuius alterius heterogenei ab homine generatur successive. Probatur: quia est divisibilis, per unam suppositionem, et quia materia ex qua generatur alteratur ab extrinseco et non ab intrinseco, etiam per unam suppositionem, et una pars eius, puta illa quae est propinquior agenti, prius erit sufficienter disposita quam alia, etiam per unam suppositionem; et per consequens de ea prius educitur pars formae asini quam de alia; et similiter sic esset de forma hominis, si poneretur divisibilis. Et, cum sic una pars formae asini primo educatur de una parte materiae et deinde alia pars formae de alia parte materiae, sequitur formam asini generari successive; et sicut argutum est de forma asini, ita posset argui de forma caprae vel alicuius alterius heterogenei ab homine. Sed diceret aliquis: si generatio formae asini esset successiva, sequitur quod non esset generatio simpliciter nec generatio substantialis; quod est falsum. Tenet consequentia ex eo quod generatio accidentalis vel generatio secundum quid fit successive; generatio autem substantialis seu generatio simpliciter dicta non fit successive. – Respondetur quod aliquam transmutationem fieri successive intelligitur dupliciter: uno modo quoad partes quantitativas, alio modo gradualiter seu quoad partes graduales. Tunc dico quod generatio substantiae non fit successive quoad partes graduales, ex quo substantia nec est intensibilis nec remissibilis, sed tamen generatio substantiae bene fit successive quoad partes quantitativas, sicut dictum est de generatione formae asini, cuius una pars generatur post aliam" (ALBERTUS DE SAXONIA, *Questiones super libros de physica auscultatione*, Liber I, q. 10, in PATAR (ed.), *Expositio et Quaestiones in Aristotelis Physicam ad Albertum de Saxonia attributae. Édition critique. Tome II*, p. 152, l. 31-153, l. 56).

[660] I leave aside on purpose the case of Marsilius of Inghen, whose discussion of *minima naturalia* in his *Physics* commentary, both chronologically and thematically, bears witness to a later phase of the debate on *minima naturalia*, one which it is not possible to analyse in the context of this thesis.

2.12.5. Changing Understandings of *Minima naturalia* in the New Intellectual Landscape of Paris in the "Mature" 14th Century: A Summary

The Medieval Latin debate on *minima naturalia* around the middle of the 14th century, at least at the Parisian Faculty of Arts, is characterising by three major innovations. Two of them, i.e., the introduction of mathematical reasoning and the reference to God's absolute power, are rather general feature of the natural philosophy developed at the same time in the same institutional context, and they do not fundamentally alter the overall consideration of the issue of *minima naturalia*. The third one, instead, is an aspect that impacts in a much more direct way the issue of *minima naturalia*. This is the belief in the fact that substantial change (or at least the process of corruption of extremely small portions of homogeneous material substances existing in isolation from the whole to which they belong) is a process taking place through an extended interval of time.

Indeed, given the fact that, especially due to the reception of the criticisms developed both by Boethius of Dacia and (especially) John Duns Scotus against "intrinsic" doctrines of *minima naturalia*, all such doctrines had lost appeal in the previous decades, commentators active at the Parisian Faculty of Arts around the middle of the 14th-century had predominantly resorted to a doctrine of *minima secundum corruptionem*. Nevertheless, once the process of corruption of extremely small portions of homogeneous material substances existing separately from the whole to which they belong is understood as a temporally extended one, the very notion of a *minimum naturale secundum corruptionem* loses its meaning. If, indeed, the corruption by the containing medium of a supposed *minimum naturale* happens over an extended interval of time, it is always possible to identify an instant belonging to that interval of time at which a portion of the supposed *minimum naturale* smaller than it comes to exist while being corrupted, and so on *ad infinitum*, according to the (potential) infinite divisibility of time.

The way to articulate the belief in the temporally extended nature of the process of corruption of extremely small portions of homogeneous material substances existing in isolation differed among commentators, reflecting their differing understandings of substantial change itself.

For Walter Burley, on the one hand, such a belief originated from the view that accidents alone can generate a new substance and that, as a consequence, substantial change is the inclusive limit of alteration. This view, indeed, although most famously formulated in the so-called *Tractatus primus*, appears to feature quite explicitly in Burley's discussion of *minima naturalia* in his last *Physics* commentary. As a consequence of such a view, although the corruption proper of extremely small portions of homogeneous material substances existing in isolation is instantaneous, their corruption, broadly conceived, comes to be temporally extended through the temporal extension of the process of alteration of which it represents the last instant.

For commentators such as John Buridan, Nicole Oresme, and Albert of Saxony, instead, the belief in the temporal extension of the process of corruption of extremely small portions of homogeneous material substances depended on what I have called the "piecemeal" view of substantial change. This view is based on the belief that substantial forms (apart from the intellective soul) are spatially extended entities having (actual) quantitative parts co-located with the parts of the matter they inform. Buridan, Oresme, and Albert of Saxony took this belief as a basis to claim that the corruption of these same substantial forms in material substances (and the generation of new ones, although Buridan does not address this latter aspect explicitly) is a process happening "part after part", so to speak. That is to say, the corrupting agent first acts on the outermost part of a material substance, corrupting the parts of its substantial form present in it, and only after that (due to the Aristotelian principle of the impenetrability of bodies) the corrupting agent can act on the innermost parts of the patient, so as to corrupt the parts of the substantial form of the patient present in them. Given this picture, substantial change is taken by Buridan, Oresme, and Albert of Saxony as corresponding to this entire process, and therefore to have its temporally extended structure.

The only (improper) notion of *minimum naturale secundum corruptionem* that can be adopted, once a temporally extended view of corruption has been taken, is that of a *minimum* corresponding to the minimal quantity in which a portion of a homogeneous material substance has the power to resist to the corrupting action of the containing medium (what Burley calls a *minimum circonstantionatum* and Oresme a *minimum resistendo contra corruptionem*). Still, Burley, Buridan, and Oresme all remark that even this notion of a *minimum* is to be nuanced. Indeed, given that it will vary depending on

the intensity of the action of the medium itself (an intensity that Burley tries to quantify, albeit in a rudimentary way), there will not be a "fixed" *minimum circonstantionatum*, or *minimum resistendo contra corruptionem*, for a given homogeneous material substance. On the contrary, there will be a *minimum circonstantionatum* or a *minimum resistendo contra corruptionem* corresponding to each of the different intensities of the medium in which such a substance is situated.

Another aspect that follows, at least according to Oresme and to Albert of Saxony, from the adoption of a "piecemeal" conception of substantial change (or at least of the corruption of extremely small three-dimensionally extended portions of homogeneous material substances), is the fact that there will not be a *minima materia* in which homogeneous material substances can be generated, since this process of generation takes place according to the (potentially infinitely divisible) quantitative parts of the matter of the relevant portion of the homogeneous material substance undergoing substantial change. Albert of Saxony even extends this view to all heterogeneous substances apart from man. As a result, what had been considered to be a separate (albeit strictly connected) issue from *minima naturalia* at least until the time of Scotus finds a solution within a comprehensive discussion of *minima naturalia* based on the adoption of the "piecemeal" view of substantial change (or at least of the corruption of extremely small three-dimensionally extended portions of homogeneous material substances). More generally, it might also be remarked in this respect that the whole discussion of *minima naturalia* in Oresme's commentary, as in Albert of Saxony's one, is structured according to a comprehensive and refined scheme that, methodologically, represents another innovation in the Medieval Latin debate on *minima naturalia* (together with the use of the vocabulary typical of limit-decision problems, that plays a particularly prominent role in structuring Albert of Saxony's discussion of *minima naturalia*).

While, therefore, the Medieval Latin debate on *minima naturalia* underwent profound changes in the Parisian context around 1350, the same is not true for what concerns the Oxford context. Indeed, in such a context (although the evidence is probably too scant to draw any strong conclusion), it appears that the central decades of the 14th century were characterised by the "revival" of typical 13th-century conceptions of *minima naturalia*. This is witnessed by Ockham's *Expositio* on the *Physics* and by his *Quaestiones* on the same Aristotelian treatise. While expounding *Physics* I.4 in the Expositio, indeed,

Ockham adopts the doctrine of *minima secundum corruptionem* (which, remarkably, is interpreted according to Scotus as a doctrine merely positing "extrinsic" *minima naturalia* in homogeneous material substances). Nevertheless, this doctrine is presented in the traditional way, within the context of an instantaneous conception of the process of corruption of extremely small portions of homogeneous material substances existing on their own, and it is accompanied by the typical Oxford argument against "intrinsic" *minima naturalia* in homogeneous material substances based on the very definition of a homogeneous entity as an entity in which all the parts have the same nature as the whole (the argument, importantly, is formulated in the "standard" 13th-century way and apparently without taking notice of Scotus' more refined formulation). In the *Quaestiones*, Ockham adopts instead a doctrine of *minima secundum operationem* in homogeneous material substances (mainly based, significantly, on the passage from Averroes' *Long Commentary* on *Physics* VII where, as I have shown above, Averroes formulates in its most clear form his doctrine of *minima secundum formam*). Nevertheless, the doctrine is formulated, even in this case, in typical 13th-century terms. True, Ockham does focus on the issue of the ability of the substantial forms of homogeneous material substances to perform their proper operation, as Brito and Jandun had done at Paris, but he claims, contrary to what both Parisian commentators had claimed in their respective *Physics* commentaries, that the substantial form of homogeneous material substances can exist in portions of matter smaller than the minimal quantity of matter in which such a substantial form can perform its proper operation. To this extent, therefore, also in this commentary Ockham seems still to be partially influenced by the argument based on the definition of a homogeneous entity as an entity whose parts have the same nature as the whole.

While, at the present state of research, it is not possible to venture any explanation concerning the different route taken by "mature" 14th-century Parisian and Oxford commentators concerning *minima naturalia*, I believe (as I have already suggested) that both routes show the influence of Scotus' discussion of *minima naturalia*. While, however, in the Parisian context Scotus' refutation of doctrines of "intrinsic" *minima naturalia* (together with Boethius of Dacia's one) brought commentators to reflect in a much deeper way on the notion *of minima secundum corruptionem*, in the Oxford context Scotus' refutation of doctrines of "intrinsic" *minima naturalia* mostly determined a loss of interest for the issue as a whole. Moreover, as I have suggested above, it might also be

the case that the sudden increase of the interest in the debate concerning mathematical and physical indivisibilism that can be witnessed at Oxford during the first half of the 14th century either influenced or was influenced by the loss of interest for the issue of *minima naturalia*.

2.13. Conclusions

It is now time to turn back to the typology I presented at the outset of the analysis of the Medieval Latin debate on *minima naturalia*, in order to summarise the main developments that all the views presented there underwent in the period between ca. 1250-ca. 1350, before introducing some more substantial conclusions to the chapter.

The first view I presented in my typology, and which represents also the metaphysically more "radical" doctrine of "intrinsic" *minima naturalia*, is the doctrine of *minima secundum corruptionem*. As I have shown, this view, already present in Averroes (who possibly derived it from Philoponus) was more thoroughly and explicitly developed by Thomas Aquinas, by Peter of Auvergne and by the Pseudo-Siger, although it remained also constantly present in the Oxford commentary tradition of the 13th century, from Adam of Buckfield until Thomas Wylton. This doctrine, however, generated a strong opposition already in the second half of the 13th century, at least at the Parisian Faculty of Arts, where it was strongly criticised by Boethius of Dacia for the fact that it presupposed (at least in principle), contrary to Aristotelian orthodoxy, that a substance could be corrupted without the action of an external contrary causal agent and, moreover, and that it could be corrupted without the generation of a new substance. Further criticisms (based on different arguments) applying to all doctrines of "intrinsic" *minima naturalia*, but having a special bearing on the doctrine of *minima secundum formam*, were also formulated by John Duns Scotus in his *Ordinatio*. As a result of these criticisms, the view tended to become a minority position in the 14th century.

A less "radical" doctrine of "intrinsic" *minima naturalia* is, as said, that of *minima secundum operationem*. This doctrine was rather popular in the early phase of the reception of Aristotle's *Physics* around the mid-13th century. It was adopted in the *Quaestiones supra libros quatuor Physicorum Aristotelis* wrongly edited under the name of Roger Bacon and also by Albert the Great in his commentary on the *De generatione*, where, in a surprising twist (one, however, that finds a close parallel in Albert's

commentary on the *De sensu* concerning *minima sensibilia*, as I will show in the next chapter), Albert tries to "reinterpret" Democritean atoms as Aristotelian *minima secundum operationem*. The doctrine of *minima secundum operationem* tends to disappear after the central decades of the 13th century (with some notable exceptions, especially in the Oxford commentary tradition: Ockham in the *Quaestiones* on the *Physics*, for instance, still resorts to it). Nevertheless, a reflection on the fact that a (substantial, but also accidental) form, in order to exist, needs to be able to perform its proper operation emerged at the Parisian Faculty of Arts at the end of the 13th century, first rather clearly in the *Physics* commentary by Radulphus Brito and also, at the beginning of the 14th century, in the one by John of Jandun. It is very difficult to fully understand the origins of this distinctive metaphysical debate, which certainly involved a wider number of *magistri artium* active at Paris between (at least) ca. 1290 and ca. 1310. The basic position adopted both by Brito and Jandun seems to be a doctrine of "intrinsic" *minima naturalia* according to which, since the ability for a (substantial, in this case) form to perform its proper operation (for a homogeneous material substance, that of acting on the outside environment so as to assimilate it to itself) is a necessary condition for its existence, and since the power required to perform such operation requires a certain quantity of matter, below such quantity of matter a substantial form is not able to perform its proper operation anymore and, *because of this*, it is corrupted. Of course, since the substantial form of homogeneous material substances cannot act on the outside environment if not through the accidental forms of its primary qualities, the power to which this doctrine refers is primarily the power of such accidental forms themselves, insofar as they act as instrumental causes of the substantial form of the compound in which they inhere. This is, therefore, a doctrine which is certainly metaphysically more "radical" than a doctrine of *minima secundum operationem* (where it is unproblematically accepted that a substantial form can exist without the ability to perform its proper operation) and, at the same time, slightly less "radical" that that of *minima secundum formam*, insofar as the existence of "intrinsic" *minima naturalia* is not a direct consequence of the metaphysical "structure" of substantial forms, but an indirect consequence of the conditions under which they (and the accidental forms of their primary qualities as instrumental causes) are able to perform their proper operation. It is extremely important to remark, in this respect, that the debate of which both Brito and

Jandun were a part was also extended by them (and by a number of contemporaneous anonymous *De sensu* commentators) to the issue of *minima sensibilia*. Indeed, as I will show in Chapter 4, both Brito and Jandun, together with their anonymous Parisian contemporaries, discuss the issue of *minima sensibilia* in terms of the relation between the ability for the accidental forms of sensible qualities to perform their proper operation (i.e., that of acting on the senses so as to engender a sensation) and the possibility for them to exist. Nevertheless, in such a context the debate will become much more detailed and, what is more, it will lead, surprisingly, to partially different conclusions than the one both Brito and Jandun achieve concerning the issue of *minima naturalia*.

Another "intrinsic" doctrine of *minima naturalia* is, as said, the doctrine of *minima secundum actionem*. This doctrine of *minima naturalia* was probably the most popular one during the early phase of the reception of the *Physics* at Oxford in the central decades of the 13th century, and it found its most refined extant classification in Geoffrey of Aspall's *Physics* commentary, dating between the late 1250s and the early 1260s. According to Aspall, a *minimum secundum actionem* (the term seems to be explicitly taken from the *translatio vetus* of *De sensu* 6, remarkably) in a homogeneous material substance is the minimal quantity of matter in which such a substance is able to achieve the intended effect of their action (Aspall distinguished between two main kinds of action for these substances: that of acting on the outside environment so as to assimilate it to themselves and that of moving towards their natural place). Below this quantity of matter, while portions of homogeneous material substances remain "active", they lack a sufficient power to achieve their intended effect. Aspall calls this latter kind of action an *actio inclinans*, as opposed to an *actio inclinans et consequens effectum*. Both *minima secundum operationem* and *minima secundum actionem* found a strong opposition at the Parisian Faculty of Arts starting at least from the 1270s, as it is evident in the commentary on the *Physics* by the Pseudo-Siger and also in Boethius of Dacia's *Physics* commentary. The Pseudo-Siger's arguments are based on a close consideration of the *auctoritas* of *De sensu* 6 (for what concerns *minima secundum actionem*) and on an argument from Averroes' *Long Commentary* on the *Metaphysics* (which will be crucial in the Medieval Latin debate on *minima sensibilia*, as I will show in the following chapters) according to which an entity that loses the power to perform its proper operation necessarily loses its essence (for what concerns *minima secundum operationem*). Instead, Boethius' argument

is based on the belief that a portion of a homogeneous material substance existing in isolation, no matter how small, never loses the power to move towards its natural place. As a result of these criticisms, the doctrines of *minima secundum operationem* and of *minima secundum actionem* mostly disappeared from the Parisian debate, although they remained present in the Oxford commentary tradition, as briefly remarked above concerning Ockham's adoption of the doctrine of *minima secundum operationem* in the *Quaestiones* on the *Physics*.

A doctrine that, as said, constitutes a limit-case between "intrinsic" and "extrinsic" doctrines of *minima naturalia* is that of *minima secundum sensum*. This doctrine was most prominently advocated by Roger Bacon in his *Physics* commentary (and, as I will show in the next chapter, also in his *De sensu* commentary). Nevertheless, some of the considerations adopted by him in this respect are also present in the *Physics* commentary that has been edited under the name of Richard Rufus of Cornwall. Moreover, such a doctrine seems to constitute a constant legitimate option in the Oxford debate on *minima naturalia*, since it makes sporadic appearances at Oxford until the first decades of the 14th century, when it is first endorsed by Scotus in the *Ordinatio* and later adopted by John Dumbleton in his *Summa logicae et philosophiae naturalis*. Moreover, this doctrine, as I will show in the next chapters, also fundamentally connotes the Oxford debate on *minima sensibilia* in *De sensu* commentaries dating from the 13th century and also from the early 14th century. As such, its importance for the present thesis could hardly be overestimated.

The only remaining doctrine of *minima naturalia* I presented in my typology is the "extrinsic" doctrine of *minima secundum corruptionem*. As it should now be clear, this position, given the fact that it posits only a very "weak" notion of *minimum naturale*, represented an attractive position for Medieval Latin commentators (and even before for Islamic ones – this position, indeed, already features prominently in Avicenna), especially for those who did not want to commit to the metaphysically more “radical” doctrines of "intrinsic" *minima naturalia* discussed above. As such, starting at least with Boethius of Dacia and with John Duns Scotus, this position came to represent, by the end of the 13th century, the natural "fallback" position for critics of doctrines of "intrinsic" *minima naturalia*. More than that, virtually all the commentators subscribing to "intrinsic" doctrines of *minima naturalia* (save, maybe, for Thomas Aquinas, partially for Albert the Great, and certainly for the Pseudo-Siger) at the same time accepted the idea that the

containing medium exerts a corrupting action on extremely small portions of material substances existing on their own. Their doctrines of "intrinsic" *minima naturalia*, therefore, are to be understood as doctrines that apply to portions of homogeneous material substances greater than those that are unable to resist to the corrupting action of the containing medium. As a result, mainly, of Boethius of Dacia's and Scotus' critiques of doctrines of "intrinsic" *minima naturalia*, during the first half of the 14th century the position of *minima secundum corruptionem* progressively became the almost universally accepted common view on *minima naturalia*. Nevertheless, as I have shown, important theoretical divergences soon emerged concerning the way in which such a position should have been interpreted. Indeed, both Walter Burley, on the one hand, and John Buridan, Nicole Oresme, and Albert of Saxony, on the other, although starting from very different theoretical premisses, challenged the traditional, instantaneous view of the unfolding of the process of substantial change, and adopted, instead, a temporally extended view of it, that is, the idea according to which substantial change (more precisely, the substantial change of a tridimensionally-extended portion of a homogeneous material substance) is a process taking place through an extended interval of time (although, as I will demonstrate in Chapter 4, this idea, presumably in a different form, was already circulating at the Parisian Faculty of Arts at the end of the 13th century, and, as I have remarked above, some authors accepted it even in the mid-13th century – one case in point being Roger Bacon). Once a temporally extended view of substantial change is adopted, the very notion of *minima secundum corruptionem* becomes meaningless. Indeed, if the corruption of even an extremely small portion of a material substance happens over an extended interval of time, even an infinitely small component of such portion comes to exist for an instant of time, according (at least) to the (potential) infinite divisibility of the interval of time through which the process of corruption happens (with, again, important distinctions between Burley on the one hand and Buridan, Oresme, and Albert of Saxony on the other). It is thus possible to claim that, by the mid-14th century, the very belief in the existence of *minima naturalia* in homogeneous material substances had come to be rejected.

The progressive “vanishing” of a meaningful notion of *minima naturalia*, at least for homogeneous material substances, that takes place in the "mature" 14th century, at least at Paris, is certainly the most surprising aspect of the investigation conducted in this

chapter. This had been due, as shown above, to the joint effect of a strenghtening belief into the ability of portions of homogeneous material substances to persist into existence in the lack of any corrupting agent and of the progressive affirmation of temporally extended conceptions of substantial change that deprive of its value the very notion of *minima secundum corruptionem*.

The surprise is even greater if one considers the extraordinary revival that the notion of *minima naturalia* enjoyed in the 16th century, when, especially thanks to commentators such as Julius Caesar Scaliger, such a notion was to take on a leading role in the creation of what Christoph Lüthy has dubbed an "Aristotelian corpuscularianism" and, more in general, in the establishment of the "corpuscularian" ontology of the early 17th century[661].

Interestingly, indeed, when one looks for possible sources of late 16th- or early 17th-century "corpuscularian" or atomistic thinkers, it is easier to refer to the doctrine of *minima secundum formam* adopted by 13th-century commentators such as Thomas Aquinas than to 14th-century ones (but even more, it is even easier to refer directly to Averroes). Indeed, it is hard to deny that the notion of *minima naturalia* (not as atoms or corpuscles, but as inferior thresholds to the persistence of material substances through progressive division) has a much stronger ontological consistency in Aquinas (or Peter of Auvergne, or even Thomas Wylton, or even more in Averroes himself) than it has in, say, Oresme or Albert of Saxony.

How, then, such an ontologically robust notion of *minima naturalia* (so robust as to be able to be used as the foundation of "corpuscularian" explanations of the natural world) emerged in the Renaissance, after the relative disappearance of *minima naturalia* in the 14th century? A hint to the solution to this puzzle can be found in the fact that at least two 14th-century atomistic thinkers, Nicholas of Autrecourt and John Wyclif, explicitly appropriated the notion of *minima naturalia* in support of their theories concerning the structure of substances, exactly in the same century in which such a notion was being challenged theoretically by Burley, Buridan, Oresme, and Albert of Saxony,

[661] See especially LÜTHY, "An Aristotelian Watchdog as Avant-Garde Physicist: Julius Caesar Scaliger", *op. cit.* For what concerns the doctrine of *minima naturalia* within the wider context of Scaliger's natural philosophy (as especially presented in the *Exotericae Exercitationes* of 1557), see also K. SAKAMOTO, *Julius Caesar Scaliger, Renaissance Reformer of Aristotelianism. A Study of His* Exotericae Exercitationes *(Medieval and Early Modern Philosophy and Science 26)*, Leiden, Brill, 2016.

under the influence of Boethius' and Scotus' critiques[662]. Therefore, it seems likely (although this would need a separate investigation) that the 14th century saw a bifurcation in the understanding of *minima naturalia*, between the proper Aristotelian notion discussed in commentaries on Aristotle's *libri naturales* and the equivocal label appropriated by atomistic thinkers such as Nicholas of Autrecourt and John Wyclif[663]. If anything, Renaissance and early modern "corpuscularian" and atomistic Aristotelian commentators, such as Scaliger, seem to be much more connected to the second, equivocal notion of *minima naturalia* than to the first one[664].

If this is so, however, the difference in the conception of *minima naturalia* between 14th- and 16th-century *Physics* commentaries is not much based on the inversion of a trend, rather, it is based on a *terminological shift*. 16th-century *minima naturalia* are rightly regarded by scholars as "corpuscles" of some sort, insofar as commentators discuss their different composition and the way in which they generate new substances by their conjunction and corrupt them by their separation. Yet, nothing comparable to such "corpuscles" can be found in 13th- and 14th-century commentaries on Aristotle's *libri*

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[662] On Autrecourt's use of the notion of *minima naturalia* in an atomistic context, see especially GRELLARD, *Nicholas of Autrecourt's Atomistic Physics*, *op. cit.* The notion of *minima naturalia* plays a much more prominent role in Wyclif's own atomistic natural philosophy, identifying them with the compound particles of elemental atoms that go on to form bodies by aggregation. On this use, see E. MICHAEL, *John Wyclif's Atomism*, *ibid*., pp. 183-220. The crucial distinction between Autrecourt's and Wyclif's use of the notion of *minima naturalia* is that, while Autrecourt ultimately identifies *minima naturalia* with atoms, Wyclif identifies them with second-order entities *composed of* atoms.

[663] A similar idea has been suggested by LAGERLUND, *Material Substance*, *op. cit*., p. 483, n. 8.

[664] A direct knowledge of Wyclif's atomism by Scaliger, for instance, is suggested as a possibility by MICHAEL, *John Wyclif's Atomism*, *op. cit*., p. 186, n. 16. Nevertheless, note that also the understanding of *minima naturalia* in commentaries on Aristotle's *libri naturales* underwent a decisive shift already in the 15th century, in comparison to the positions taken in the mid-14th century by Parisian commentators. Indeed, the belief in the existence of intrinsic *minima naturalia*, and particularly of *minima secundum formam*, achieved a renewed popularity in the Renaissance, after its relative neglect throughout the 14th century. This is signaled by the fact that it is taken to be the correct interpretation of Aristotle's doctrine of *minima naturalia* (and even the one universally accepted by the *Peripatetici*, remarkably) in Augustinus Nifo's *Physics* commentary (cf. AGOSTINO NIFO, *Super octo Aristotelis libros de physico auditu*, Venetiis, apud Hyeronimum Scotum, 1569, f. 40a: "Propter haec absolute cum Peripateticis sentio, cuiuslibet generati esse minimum et maximum inclusive, et ex parte intrinseca. Ubi debes scire, ut colligitur ab Averroe in dictis locis, quod radix terminationis est forma, e qua proficiscitur actio et species; radix vero interminationis est materia ipsa, quae est quaedam, ut Platonice loquens, infinitudo. Et ita videtur forma determinata maximo et minimo, quia est forma activa alicuius effectus, quem agere non potest sub quacunque quantitate. Haec est positio omnium peripateticorum"). The reason for the renewed popularity of this view in commentators such as Nifo might be a result of the influence exerted by Averroes' views on Paduan Aristotelianism during the 15th and the 16th century. It might be, then, that the renewed popularity of *minima secundum formam* as the correct interpretation of the "proper" notion of *minima naturalia* reinforced and contributed to legitimise the "corpuscularian" understanding that had developed independently from it, based on the use of the notion of *minima naturalia* of the likes of Autrecourt and Wyclif, and thoroughly adopted by 16th-century thinkers such as Scaliger.

naturales (with the partial exception, among those discussed in this chapter, of Albert's *De generatione* commentary and, among those that will be discussed in the next chapters, of an important group of *De sensu* commentaries).

More in general, no 13th- or 14th-century commentary, among those on the *Physics* and the *De generatione* analysed in this chapter (apart from Albert's *De generatione* commentary), does ever hint at the fact that *minima naturalia* should be treated as "corpuscles" of sort, or that their conjunction and separation could be the cause of the generation and the corruption, respectively, of material substances. This is the reason why I have tried to show throughout the chapter that the right theoretical framework to analyse 13th- and 14th-century discussions of *minima naturalia* (not the exclusive one, but certainly the most appropriate one) is that of the persistence of material substances through progressive division and, at the limit, at least for "mature" 14th-century Parisian commentators, through the process of their corruption.

This is, I believe, an important finding of the chapter, which reinforces also the idea that an analogous framework should be applied to the case of *minima sensibilia*, insofar as, as documented in the chapter, *De sensu* 6 plays a key role in discussing alternative views on *minima naturalia*. True, the *auctoritas* of the *De sensu* seems to lose its importance in the 14th century, but this is only (or mostly) because the very idea of a *minimum naturale* (and, correlatively, of a *minimum sensibile*) seems to be progressively vanishing, not because the commentators' attitude to read the text of *De sensu* 6 in connection with that of *Physics* I.4, or, more in general, in connection with passages dealing with *minima naturalia*, had changed.

Still, *minima sensibilia*, as said in the Introduction to the thesis, do pose some specific issues which can be disregarded in the case of *minima naturalia* and, moreover, the commentary of *De sensu* 6 by Alexander of Aphrodisias, extremely influential from the 1270s onwards, introduced a whole set of new ones (or, at the very least, made Medieval Latin commentators' much more painfully aware of them). This is the reason why, in the next two chapters, I will try to show, together with its intrinsic interest, the degree of theoretical independence (albeit not of separation) of the Medieval Latin debate on *minima sensibilia* between ca. 1250 and ca. 1350 from the contemporary one on *minima naturalia*.

CHAPTER 3

The Medieval Latin Debate on the Problem of *Minima sensibilia* (ca. 1250-ca. 1300)

3.1. Introduction

The Medieval debate on the problem of *minima sensibilia*, at least in the Latin West of the 13th and the 14th century, is inextricably linked to the issue of *minima naturalia* discussed in the previous chapter of this thesis. This is not usually acknowledged in the context of discussions of *minima sensibilia* (i.e., in commentaries on *De sensu* 6, 445b3-446a20). These discussions do not have the tendency to link the problem of the infinite divisibility *per accidens* of sensible qualities to that of the infinite divisibility *per accidens* of substantial forms. Nevertheless, as I have tried to show in the previous chapter, the reverse is frequently true. That is to say, Medieval Latin commentators tended to bring into play (sometimes as the decisive text) *De sensu* 6 while discussing the issue of *minima naturalia*, especially in the context of commentaries on *Physics* I.4. This is, I believe, important evidence of the fact that Medieval Latin commentators considered the two issues of *minima naturalia* and of *minima sensibilia* as largely analogous and inextricably linked with each other. In this sense, the fact that references to *minima naturalia* (and to the text of *Physics* I.4 in particular) are not as present in commentaries on *De sensu* 6 as references to *De sensu* 6 are in commentaries on *Physics* I.4 (although they are certainly not altogether absent) is probably due to the fact that the issue of *minima naturalia* was considered as a preliminary one to the issue of *minima sensibilia*. This is certainly so from the theoretical point of view, insofar as substantial forms have an ontological (and logical) priority over the accidental forms of sensible qualities in the Aristotelian tradition. Yet, this is so also from an "institutional-curricular" point of view. Given that all the most important textual places in the Aristotelian *corpus* where the issue of *minima naturalia* is discussed (*Physics* I.4, but also *De generatione* I.5 and *De anima* II.4, for instance) had to be read and commented upon, according to the known statutes of the Faculties of Arts active in the 13th and in the 14th century, before getting to the text of the *De sensu*, once *magistri* reached *De sensu* 6, they

had already analysed the issue of *minima naturalia* in all its nuances. Therefore, I think, it is natural that they tended to discuss the issue of *minima sensibilia* in its own right, not as another place to bring into play the issue of *minima naturalia*.

This said, nothing in Medieval Latin commentaries on *De sensu* 6 contradicts the observation that, in general, the solution given to the issue of the infinite divisibility of sensible qualities in material substances is fully compatible with the solution given by the same *magistri*, in commentaries on *Physics* I.4 especially, to the issue of the infinite divisibility of the substantial forms of material substances. What is more, at least one of the possible solutions to the issue of *minima naturalia* discussed in the previous chapter, i.e., the solution I referred to as that of *minima secundum sensum*, is as much a solution to the issue of *minima sensibilia* as it is to that of *minima naturalia* (and probably even more), insofar as it explicitly refers to the ability of the substantial form of a material substance to act on the external senses, and such an operation is performed not by the substantial form itself, but rather by the accidental forms of its inhering sensible qualities. Even the views of *minima secundum operationem* and of *minima secundum actionem* consider the case of the ability of a material substance to act on the external senses, although this is part of a wider reflection on their ability to operate on the outside environment. Furthermore, in John Duns Scotus' attack against the notion of intrinsic *minima naturalia*, as I have shown, there is also an explicit rejection of the existence of "intrinsic" *minima sensibilia*. Finally, the same rejection features also in the case of Nicole Oresme, whose peculiar ontology of sensible qualities, however, situates him in a *sui generis* position in the context of the debate on *minima sensibilia*.

Nevertheless, these considerations should not overshadow the fact that the Medieval Latin debate on *minima sensibilia* has important elements that set it apart from the debate on *minima naturalia*. The most important one is an epistemological aspect (which, however, has fundamental ontological implications) of great importance. Indeed, it is a frequently stated principle of Aristotle's theory of cognition that a sensible quality is defined by its ability to act on the corresponding external sense, so that if it were unable to do so, it would exist uselessly. One does not have to look far in order to find this principle expressed in the *De sensu*. Indeed, this is one of the arguments that Aristotle mentions at the beginning of the discussion on *minima sensibilia* against the view that sensible qualities are infinitely divisible (in act). If sensible qualities were infinitely

divisible, they would inhere in portions of matter so small that they could never be perceived. Therefore, sensible qualities are not infinitely divisible (in act). Aristotle, of course, did not mean to deny that in any given material substance there are portions of matter so small that nobody could ever perceive their sensible qualities. Yet, the sensible qualities of any portion of matter whatsoever contribute to make the whole to which they belong perceptible. If these portions were to exist separately from the whole to which they belong, they would immediately be corrupted by their containing medium, as Aristotle clearly states in *De sensu* 6 (and as already discussed in the previous chapter).

Aristotle's considered conception, therefore, seems to be that the threshold of perceptibility of matter is equal (or inferior) to the threshold required to matter in order for it (and, therefore, for its sensible qualities) to be able to resist to the corrupting action of the containing medium. This conceptual model ensures that the perceptual structure of the world remains always fully graspable by the external senses. That is to say, no sensible quality existing on its own can ever escape being detected by its corresponding external sense (obviously if the sense is within a suitable distance from the substance in which the quality inheres, and if there are no hindering factors[665]). This principle is the one I call that of the coextension of the world of the sensible qualities and of the world which can be perceived in act, or, for short, between the sensible world and the perceptible one, an epistemological principle whose consideration lies at the core of Medieval Latin commentaries on *De sensu* 6, as I will show throughout the chapter.

However, this principle came under fire already in Late Antiquity (following a problematic remark that Aristotle himself added at the end of his discussion of the issue of *minima sensibilia*). Indeed, in *De sensu* 6, 446a10-15 Aristotle considers what would happen in the absence of the corrupting action of the containing medium, and he seems to claim that, within the limits of this thought experiment, it would be possible for sensible qualities to exist on their own without being perceptible in actuality, at least until they become part of a larger sensible whole. Alexander of Aphrodisias, in his commentary on *De sensu* 6, gave a special attention to Aristotle's remark, and he developed it so as to produce what could be called a "corpuscularian" model of sensible qualities, although

[665] The problem of the distance of the object in which sensible qualities inhere from the corresponding external sense of the perceiver (for the three senses perceiving at a distance, i.e., sight, hearing, and smell) is mentioned by Aristotle in *De sensu* 7, 449a20-32, where he clearly states that it is impossible to see, hear or smell from an infinite distance and there is a fixed maximal distance for perception at a distance to occur.

clearly limited to a possible world without the corrupting action of the containing medium.

After Alexander's commentary was translated into Latin by William of Moerbeke probably in 1260, its impact on the debate on *minima sensibilia*, and especially on the issue of the coextension between the sensible world and the perceptible one could be hardly overestimated. Indeed, as I will show throughout the chapter, starting from the end of the 13th century and the beginning of the 14th century, Medieval Latin commentators on the *De sensu* (especially in Paris) started to discuss whether Aristotle's remark at 446a10-15, with all its implications, could be also extended to the actual world[666].

The theoretical changes contributing, together with Alexander's influence, to produce such a conceptual shift, were mainly two. On the one hand, the "piecemeal" conception of substantial change (and, more in general, all the Medieval Latin understandings of substantial change taking it to be, directly or indirectly, a temporally extended process), as already shown in the previous chapter, fundamentally altered not only the notion of a *minimum naturale secundum corruptionem*, but also that of a *minimum sensibile secundum corruptionem*, insofar as, once such conception is accepted, it cannot be denied that any sensible quality, no matter how small the portion of matter to which it is united, exists on its own for a certain amount of time throughout the process of corruption, given that such a process happens throughout an extended interval of time. On the other hand, a series of commentators, beginning with John of Jandun, whose importance for the Medieval Latin debate on *minima sensibilia* can hardly be overestimated, regardless of whether substantial change was conceived to happen instantaneously or not, started to challenge the Aristotelian idea that the threshold of perceptibility of sensible qualities is the same as (or inferior to) that of their corruptibility, and they posited that, instead, it is superior to it.

As a result of these parallel developments, during the central decades of the 14th century the existence on their own, in the actual world, of sensible qualities that are not perceptible in act started to be accepted as a matter of fact. This might seem an apparently

[666] Note that, in this and in the next chapter, I will use systematically the concepts of 'actual' and 'possible worlds', which are taken from contemporary analytic modal logic. Nevertheless, it should be remarked that I use these terms just for reasons of clarity and expediency. I do not intend them as meaning anything more than the opposition between the ordinary course of nature (the actual world) and possible alternative courses of nature which do not abide by all the laws that govern the ordinary course of nature (possible worlds).

minor change, yet, I think, its conceptual implications in the *longue durée* of intellectual history are paramount. Indeed, considering sensible qualities as capable of existing on their own without being able to act on the external senses gives them a degree of ontological (and epistemological) autonomy from the external senses and therefore from human cognition that they had never previously enjoyed in the Aristotelian tradition. On this view, everything which exists in actuality in the natural world is sensible, regardless of whether we could ever perceive it or not. The natural world, all at once, becomes much wider, and much more varied, than Aristotle would have been ready to admit. Portions of matter endowed with some sensible qualities could exist, without us ever noticing, in the "middle-size" substances whose sensible qualities we perceive. The natural world becomes dappled, therefore (potentially) opening the way to Renaissance and early modern corpuscularian theories of material substances.

The reference to corpuscularianism might seem surprising, given how much I stressed, in previous chapters, the Medieval Latin commentators' unflinching belief in the (potential) infinite divisibility of magnitudes and the fact that the debate on *minima naturalia* is not an episode in the history of atomism or corpuscularianism. Therefore, in order to avoid possible misunderstandings, the point I am making here must be stated more carefully. I do not in any way claim that the Medieval Latin debate on *minima sensibilia*, contrary to the one on *minima naturalia*, should be considered as part of the history of atomism or corpuscularianism. The opposite is true: given the inextricable link between the two debates, as I have said above, it would be contradictory to claim so.

Nevertheless, what I claim is that a "corpuscularian" element in the debate on *minima sensibilia*, differently from that on *minima naturalia*, was present since the beginning, at least since Alexander's commentary on *De sensu* 6, which develops, in this respect, a problematic Aristotelian remark, that is, the reference to imperceptible portions of matter endowed with their sensible qualities which could become perceptible only by uniting with a sufficient quantity of matter endowed with the same sensible qualities. This idea (whose implications I will detail throughout this chapter and the next one), once accepted by Medieval Latin commentators, introduced such a "corpuscularian" element in the Medieval Latin debate on *minima sensibilia*. When, moreover, it became commonplace to apply such a model not only to a possible world deprived of the corrupting action of the containing medium, but also to the actual one, such a

"corpuscularian" element became even more prominent. It is of course an open question if, and in the positive case to what extent, this element had any influence on Renaissance and Early Modern corpuscularian, or even atomistic, doctrines, but this question goes far beyond the scope of my thesis.

3.1.1. A Typology of the Medieval Latin Debate on *Minima sensibilia* (ca. 1250-ca. 1350)

Two final aspects must be discussed in the present introduction. The first one concerns the possibility to provide a typology of the Medieval Latin positions concerning *minima sensibilia* that will be detailed throughout this chapter and the next one. The task is certainly more complex in this case than it was in the case of *minima naturalia*. Indeed, as I will clearly show below, while Aristotle did not develop a full-fledged doctrine of *minima naturalia*, he certainly put forth, in *De sensu* 6, 445b3-446a20, a clear doctrine of *minima sensibilia*, which could be called, with a series of specifications, a doctrine of "extrinsic" *minima sensibilia secundum corruptionem*, whereas, in the absence of the corrupting action of the containing medium, the only remark he put forth concerning "intrinsic" *minima sensibilia* is that, as mentioned above, sensible qualities smaller than the threshold of perceptibility would have to exist on their own without being perceptible in act. The presence of this clear Aristotelian doctrine provided a basic framework that was shared (at least as a point of departure) by all Medieval Latin commentators discussing *De sensu* 6, 445b3-446a20.

In this sense, it is true that all the Medieval commentators that will be discussed in this and in the next chapter (with the possible exception of Albert the Great) subscribe to a theory of *minima sensibilia secundum corruptionem* (therefore to an "extrinsic" theory of *minima sensibilia*), with, however, important differences concerning the way (instantaneous or temporally extended) in which the corrupting action of the containing medium is understood. Another important faultline in this respect, as said, is represented by whether Medieval commentators considered the threshold of perceptibility of sensible qualities to be the same as (or inferior to) that of their corruptibility, or rather a superior one. Finally, a third line of conflict is represented by whether commentators recognised a causal role to the containing medium, or whether they believed that the corruption of

sensible qualities happens by division alone, and the fact that matter acquires the sensible qualities of the containing medium is an altogether separate (and contingent) issue.

Thanks to Aristotle's remark at 446a10-15, however, concerning what would happen in the absence of the corrupting action of the containing medium, all Medieval Latin commentators (at least all of those who became acquainted with Alexander's commentary) also had to consider the possibility of the existence of "intrinsic" *minima sensibilia*, if not in the actual world, at least in a possible one without the corrupting action of the containing medium. In this sense, all Medieval Latin commentators (with the exception of Thomas Aquinas) adhered to a "minimalist" notion of *minima secundum sensum*, according to which, either in the actual world or in a possible one without the corrupting action of the containing medium, there are minimal portions of matter existing on their own whose sensible qualities can be perceived in act, so that the sensible qualities of portions of matter smaller than them existing on their own could not be perceived in act. Still, important differences emerged in the way in which this impossibility was understood.

Some commentators believed that there is a minimal size of matter below which sensible qualities do not possess the power to act on the external senses (although they still retain a disposition to acquire it when present in greater quantities of matter), therefore resorting to a more specific notion of *minima secundum sensum* (either on its own or in the context of a more general notion of *minima secundum actionem* or *operationem*).

Other commentators, instead, held forth to the view that sensible qualities are always "active", regardless of the size of the portions of matter to which they are united, and their failure to cause a sensation is only due to the weakness of the external senses. Still other commentators subscribed to an even stronger view concerning "intrinsic" *minima sensibilia* (one strongly connected to a view of *minima naturalia secundum formam*), according to which, in analogy with their view of *minima naturalia*, the accidental forms of sensible qualities always metaphysically determine the minimal quantity of matter in which they can inhere, so that smaller portions of matter could not even *possess* the accidental forms of their own sensible qualities.

The crude oversimplification of this basic typology, however, should not make one forget that all these "basic" positions had important further nuances, whose intrinsic

interest and theoretical refinements will be at the centre of the present chapter and of the following one.

3.1.2. Defining the *Corpus*

A final introductory word must be added concerning the textual basis on which this chapter is founded. Indeed, the topic of *minima sensibilia* is discussed in its own right (at least as far as I know) only in commentaries on *De sensu* 6, 445b3-446a20 (although some indications can also be found, for instance, in commentaries on *De sensu* 7, 449a20-21, where Aristotle clearly affirms that no indivisible is sensible). This has traditionally hindered studies aiming to analyse the Medieval Latin debate on *minima sensibilia*, since only a few *De sensu* commentaries dating from the 13th and the 14th century are available in critical or early modern printed editions[667]. More precisely, the commentaries attributed to Roger Bacon, Albert the Great, Thomas Aquinas, Peter of Auvergne and Nicole Oresme or Albert of Saxony have been critically edited to date. Other critical editions are in progress, such as, for instance, that of Walter Burley's *Expositio* on the *De sensu*. Moreover, many editions of individual *quaestiones* from other question commentaries have also been published (although none of them dealing with *quaestiones* on the issue of *minima sensibilia*). To this, one should add the early modern printed editions of John of Jandun's *De sensu* commentary, and of (one redaction of) John Buridan's one.

Judging from this brief overview, it might seem that the number of Medieval Latin *De sensu* commentaries is far more reduced than, for instance, *De anima* ones, and very small indeed even in absolute terms. Nevertheless, a close look at the manuscript tradition tells otherwise. Indeed, in appendix to this thesis I provide a thorough inventory of manuscripts preserving *De sensu* commentaries dating from the 13th to the 15th century, and the result is, I believe, telling. The inventory lists manuscripts preserving 45 attributed commentaries (including those mentioned above, and counting separately the different redactions of commentaries attributed to the same authors) and 48 anonymous ones, for

[667] All the bibliographic references will be provided when dealing with these commentaries throughout this and the next chapter.

a total of 93 commentaries (to which one should add all the glosses, *compendia*, epitomes and collections of *auctoritates* on the *De sensu*, which I do not include in the inventory).

The numbers are, as it should be clear, imposing, and the extremely limited number of Medieval Latin *De sensu* commentaries available in printed editions is only evidence of the fact that this text, starting with the Renaissance, was increasingly perceived as a marginal one and a mere complement to the *De anima*. This attitude is perfectly epitomised by the *Commentarii Collegii Conimbricensis Societatis Iesu In libros Aristotelis, qui Parva Naturalia appellantur*, the volume dedicated to the *Parva naturalia* in the *Cursus Conimbricensis*, the series of "Aristotelian handbooks" prepared by the Jesuits at Coimbra during the 16th century and having, literally, a "global" circulation throughout the Jesuit *studia* which were being founded in every corner of the known world at a fast pace. Indeed, Friar Manuel de Góis, the author of the volume of the *Cursus* devoted to the *Parva naturalia*, did not deem it necessary to include a commentary on the *De sensu* (differently from the other *Parva naturalia*) exactly because of the fact that, according to him, the contents of the text did not add anything of great significant to the text of the *De anima*[668]. Although, of course, this attitude is not shared by modern and contemporary scholars, it is true that a negative prejudice towards Medieval Latin commentaries on the *De sensu* has endured until the present, and the situation is only slowly starting to change.

In what follows, of course, I do not even try to take into consideration all the Latin commentaries to the *De sensu* dating from the 13th to the 14th century, which, although certainly less than the total number of those listed in my inventory, remain nevertheless significant in number. More humbly, but also, I think, more effectively, I will take into consideration all the attributed and anonymous commentaries (leaving to the side the glosses, which I only quote when directly relevant to the discussion of commentaries, insofar as they would deserve a separate study) which can be dated with good probability to the period between ca. 1250 and ca. 1350, which is the chronological timeframe that I

[668] MANUEL DE GÓIS, *Commentarii Collegii Conimbricensis Societatis Iesu In libros Aristotelis, qui Parva Naturalia appellantur*, Olisipone, apud Simão Lopes, 1593, f. 2: "Libri Aristotelis quos nostrates philosophi *Parva naturalia*, id est, parva de rebus naturae opuscula inscripsere, supplementa quaedam sunt librorum *De anima*. Continent enim explicationem quarundam affectionum, quae aut omnibus viventibus conveniunt, ut mors et vita; aut solis animantibus, ut vigilia, somnus, respiratio. Sequimur autem in hoc opere eandem methodum, et scribendi rationem, quam in [in] *Meteoris* ob eas causas quas ibidem exposuimus. Quod tamen ad libros *De sensu et sensi<bi>li* attinet, in quibus Aristoteles de sensuum organis, eorumque obiectis potissimum disserit, statuimus nihil hoc loco in eos commentari, quod tota ea disputatio abunde tractata atque illustrata a nobis sit in libris *De anima*, quos una cum libris *De ortu et interitu* propediem favente Deo in lucem edemus."

have adopted throughout the thesis. In order to identify the commentaries falling within these chronological boundaries, I have considered all the commentaries that are attributed to masters active within this timeframe, and all the anonymous ones which are preserved in at least one manuscript witness dating within this timeframe, or, in some peculiar cases, anonymous commentaries that, although preserved in manuscripts dating after ca. 1350, nevertheless show an extremely tight connection with the debate on *minima sensibilia* conducted before ca. 1350. Of course, it is more than likely that a certain number of anonymous commentaries preserved in later manuscript witnesses and without such a strong connection with the previous debate do indeed belong to the timeframe I focus on (although most of them very likely do not, since they appear to be a result of teaching at the Faculties of Arts of the new universities that were being founded in Central and Eastern Europe starting from the second half of the 14th century). Nevertheless, I think that the textual basis that I have established is solid enough to allow to see the Medieval Latin debate on *minima sensibilia* taking place between ca. 1250 and ca. 1350 emerge in all its vigour and in all its many ramifications. According to such criteria, the list of commentaries suitable to be included in this chapter (and in the next one) is the following one[669]:

- Attributed commentaries (in probable chronological order):

- Adam of Buckfield or his circle (in three versions) (mid-13th century)
- Roger Bacon (early 1250s)
- Albert the Great (1255/1256-1256/1257)
- Geoffrey of Aspall (1260s)
- Thomas Aquinas (1268-1270; probably 1268-1269)
- Peter of Auvergne (1274-1284, probably 1279-1284)
- John Felmingham (?) (late 13th century)
- Radulphus Brito (ca. 1290- ca. 1305)

[669] For information concerning the manuscript witnesses of the attributed commentaries, and, in general, more details on all the manuscripts preserving the *De sensu* commentaries in the list (and the type and structure of the commentaries thesmelves), see the Appendix to the present thesis. The tentative dates of attributed commentaries, and the hypothetical chronological order of anonymous ones, are justified case by case throughout this chapter and the next one, or otherwise based on an analysis of the contents and style of the commentaries themselves.

- Peter of Flanders (?) (around 1300)
- John of Jandun (1309)
- Walter Burley (two versions) (1301-1307 and early 14th century)
- Matthew of Gubbio (?) (early 14th century)
- John Buridan (three versions) (before 1343, 1359 and mid-14th century)
- Nicole Oresme/Albert of Saxony (1350s-early 1360s)

- Anonymous commentaries (in hypothetical chronological order of the *De sensu* commentaries contained in them):

- Ms. Oxford, Bodleian Library, Digby 55 (13th century), ff. 22r-25v (*De sensu* commentary dating to the mid-13th century).
- Ms. Oxford, Bodl. Library, Digby, 150, ff. 32-34 (*De sensu* commentary dating to the second half of the 13th century).
- Ms. Oxford, Merton College Library, 276 (early 14th century), ff. 1r-8v, containing the same text as ms. London, British Museum, Add. 18630 (first half of the 15th century), ff. 54r-67v (*De sensu* commentary dating to the late 13th century of the very first years of the 14th century, that could represent a third version of Burley's commentary).
- Ms. Paris, Bibliothèqe Mazarine, 3473 (end of the 13th century-beginning of the 14th century), ff. 123r-123v (*De sensu* commentary dating to late 13th century).
- Ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3061 (around 1300), ff. 145r-150r (*De sensu* commentary dating to late 13th century).
- Ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 13326 (13th-14th century), ff. 50r-54v (*De sensu* commentary dating to late 13th century).
- Ms. Praha, Knihovna Metropolitní Kapituly, M. LXXX (late 13th-early 14th century), ff. 131v-132v (fragment of a *De sensu* commentary dating to late 13th century-early 14th century).
- Ms. Paris, Bibliothèque nationale de France, Lat. 16222 (14th century, before 1338), ff. 40r-41v (fragment of a *De sensu* commentary dating to the early 14th century).

- Ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 721 (14th century), ff. 53r-58v (*De sensu* commentary dating to the early 14th century).
- Ms. Paris, Bibliothèque nationale de France, Lat. 16160 (around 1300, before 1310) (*De sensu* commentary dating probably to 1309-1310).
- Ms. Oxford, Oriel College Library, 33 (late 13th or early 14th century), ff. 192-197v (*De sensu* commentary dating probably to ca. 1310-ca. 1320).
- Ms. Basel, Universitätsbibliothek, F.V.10 (ca. 1343), ff. 96r-107r (57r-68r, according to the all foliation) (*De sensu* commentary dating to the 1330s-early 1340s, preserved in a manuscript that, moreover, also includes one version of Buridan's *Quaestiones* on the *De sensu*, provided an important *terminus ante quem* before 1350 for the text).

Among these 31 commentaries (counting separately the various versions of commentaries attributed to the same masters, which frequently present important doctrinal differences), however, quite a few are not analysed in the study conducted in this chapter and in the next one, either because they do not discuss at all the issue of *minima sensibilia*, due to the fact that they break off before starting their analysis of *De sensu* 6, or because, even if they discuss the issue, they do so in such a limited way that including them in this study would have made it more cumbersome without any clear advantage.

The ones that do not cover the text of *De sensu* 6 are the following ones: Geoffrey of Aspall's commentary, that breaks off before reaching *De sensu* 6, Matthew of Gubbio (?)'s commentary, that only presents a selection of questions on relevant aspects of the *De sensu* (none of them dealing with the issue of *minima sensibilia*), the commentary of ms. Praha, Knihovna Metropolitní Kapituly, M. LXXX, that only contains twelve *dubitationes* on *De sensu* 1, the commentary of ms. Paris, Bibliothèque nationale de France, Lat. 16222, that, again, contains only a fragment of a commentary, not dealing with the issue of *minima sensibilia*, and, finally, the commentary of ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 721, that only contains a limited number of *quaestiones* on some aspects of the *De sensu*.

The ones, instead, whose discussion of *minima sensibilia* does not add anything of interest to the present study are the following ones: the commentary of ms. Oxford, Bodleian Library, Digby 55, the commentary of ms. Paris, Bibliothèqe Mazarine, 3473,

the commentary of ms. Città del Vaticano, BAV, Vat. Lat. 13326, and the commentary of ms. Basel, Universitätsbibliothek, F.V.10, to which one should add the perculiar case of the commentary of ms. Oxford, Bodl. Library, Digby, 150, ff. 32-34, which constitutes a mere *abbreviatio* of Albert the Great's *De sensu* commentary.

The fact that these commentaries do not discuss at all (or not in a sufficiently sustained way) the issue of *minima sensibilia*, nevertheless, does not in any way diminish their great historical and theoretical significance for the study of the Medieval Latin *De sensu* commentary tradition.

The remaining commentaries, therefore, are the ones that will be included in this chapter and in the next one, and they are the following ones:

- Attributed commentaries (in probable chronological order):

- Adam of Buckfield or his circle (in three versions) (mid-13th century)
- Roger Bacon (early 1250s)
- Albert the Great (1255/56-1261/63)
- Thomas Aquinas (1268-1270; probably 1268-1269)
- Peter of Auvergne (1274-1284, probably 1279-1284)
- John Felmingham (?) (late 13th century)
- Radulphus Brito (ca. 1290- ca. 1305)
- Peter of Flanders (?) (around 1300)
- John of Jandun (1309)
- Walter Burley (two versions) (1301-1307 and early 14th century)
- John Buridan (three versions) (before 1343, 1359, and mid-14th century)
- Nicole Oresme/Albert of Saxony (1350s-early 1360s)

- Anonymous commentaries (in hypothetical chronological order of the *De sensu* commentaries contained in them):

- Ms. Oxford, Merton College Library, 276 (early 14th century), ff. 1r-8v (*De sensu* commentary dating to the late 13th century), containing the same text as ms. London, British Museum, Add. 18630 (first half of the 15th century), ff. 54r-67v

- Ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3061 (around 1300), ff. 145r-150r (*De sensu* commentary dating to late 13th century).
- Ms. Paris, Bibliothèque nationale de France, Lat. 16160 (around 1300, before 1310) (*De sensu* commentary dating probably to 1309-1310).
- Ms. Oxford, Oriel College Library, 33 (late 13th or early 14th century), ff. 192-197v (*De sensu* commentary dating probably to ca. 1310-ca. 1320).

I believe that this group of 21 commentaries still provides a reasonable overview that covers all the period from around 1250 to around 1350 both at Paris and Oxford (with some hints also to the debate taking place at Cambridge), also connecting the debate on *minima sensibilia* taking place towards the end of this period with the debate that would have been conducted in the new commentaries that started to be prepared at the newly founded universities in central and eastern Europe from the latter half of the 14th century onwards. As concerning the type of commentaries analysed, I will include both literal and question commentaries, although it is a fact that, among the preserved commentaries, question commentaries dramatically outnumber literal ones and, save for a few exceptions (such as Bacon's, Albert's and Aquinas' commentaries) they are of greater theoretical significance.

The structure of this chapter, and of the following one, is in harmony with the methodological principles I have adopted in previous chapters. I therefore start from an analysis of the relevant Aristotelian texts (together with their Medieval Latin translations), then I move on to Late Ancient commentators, followed by Islamic ones, and only after these passages I start discussing Medieval Latin commentators in their own right, following a chronological order (indeed, this chapter only includes commentaries up to ca. 1300, while the following one covers the period ca. 1300-1350), but also trying to identify some main thematical lines. The conclusions summarise the main findings of this chapter and of the next one and sketch some paths for further investigation.

3.2. Aristotle's *De sensu* 6, 445b3-446a20

The issue of the infinite divisibility of sensible qualities is raised by Aristotle as the first of three *aporiai* which are presented in the last two chapters of the *De sensu* (in the previous chapter I only briefly referred to the main aspects of the Aristotelian solution,

but here I present the Aristotelian text in all its nuances). Indeed, after discussing each external sense and its proper sensible, Aristotle devotes the last portion of the *De sensu* to three theoretically independent issues which concern (save for one exception) all of the sensible qualities (and of the external senses). The first one of them is, as said, the issue of the infinite divisibility of sensible qualities, which is then followed by the issue of whether perception is instantaneous or successive (for the distance senses) (cf. *De sensu* 6, 446a20-447a11) and of whether it is possible to simultaneously perceive different sensible qualities, both of the same genus and of different ones (cf. *De sensu* 7, 447a11-449a31).

The issue of the infinite divisibility of sensible qualities is introduced by Aristotle referring to the principle of the (potential) infinite divisibility of magnitudes (cf. *De sensu* 6, 445b3-5)[670]. Indeed, insofar as the matter of the material substances in which sensible qualities inhere, as an extended magnitude, is (potentially) infinitely divisible, it should be asked whether also the sensible qualities inhering in the substances themselves are infinitely divisible *per accidens* through the (potential) infinite division of matter. The fact that Aristotle formulates the problem in hylomorphic terms is important, insofar as, as I have shown in the previous chapter, such a clear hylomorphic formulation cannot be found in any of the places where the issue of *minima naturalia* is foreshadowed by Aristotle. This points to the fact that, contrary to what happens with *minima naturalia*, Aristotle seems to have a proper doctrine of *minima sensibilia*. This is also one of the main reasons, I believe, why the text of *De sensu* 6 was so frequently quoted by Medieval Latin commentators in the context of discussions of *minima naturalia*. Indeed, it appeared

[670] For important remarks on *De sensu* 6, 445b3-446a20, see ROBERT, "John of Jandun on *Minima sensibilia*", *op. cit.*, pp. 369-378, and also R.R.K. SORABJI, "Aristotle on Colour, Light and Imperceptibles", *Bulletin of the Institute of Classical Studies* 47, 2004, pp. 129-140, pp. 134-135. See also ARISTOTLE, *De sensu and De memoria. Text and Translation with Introduction and Commentary*, ed. G.R.T. ROSS, Cambridge, Cambridge University Press, 1906, pp. 27-30, which outlines all the most important steps of Aristotle's discussion in the text, and which also situates it within the larger context of *De sensu* 6-7, and see ARISTOTLE, *Parva naturalia. A Revised Text with Introduction and Commentary*, ed. ROSS, *op. cit.*, pp. 27-28. Note that I quote the text of the *De sensu* from this edition (which is in itself highly indebted to G.R.T. Ross' previous one, which, in itself, remains rather close to ARISTOTELES, *Parva naturalia*, ed. G. BIEHL, Lepizig, Teubner, 1898), since the most recent edition of the text of the *De sensu* (ARISTOTELES, *Parva naturalia (Collectio philosophica Lateranensis 5)*, ed. P. SIWEK, Roma, Desclée, 1963) is rather deficient in comparison with that of W.D. Ross' edition (cf. G.E.R. LLOYD, Review to Aristotle, *Parva naturalia*, ed. P. Siwek, *The Journal of Hellenic Studies* 85, 1965, pp. 212-213. The same goes for ARISTOTE, *Petists Traités d'Histoire Naturelle. Texte établi et traduit (Collection Budé)*, ed. R. MUGNIER, Paris, Les Belles Lettres, 1953 (cf. D.J. FURLEY, Review to Aristote, *Petits Traités d'Histoire Naturelles*, ed. R. Mugnier, *The Classical Review* 5 (1), 1955, pp. 61-63).

from the outset that this text was the only passage where Aristotle presented a solution to the issue of *minima tout court*.

Aristotle starts his discussion by presenting the main argument against the view that sensible qualities are infinitely divisible (*De sensu* 6, 445b7-11). This is the argument to which I already alluded in the introduction. Aristotle notes that any sensible quality existing in act must be capable of acting on the corresponding external sense, since it takes its name of 'sensible' from its ability to act on the sense. Therefore, if sensible qualities were (potentially) infinitely divisible, then also the external senses should be, but this is impossible, since otherwise they would have an infinite power (but no power in the natural world is infinite). Moreover, and correspondingly, Aristotle also notes that if sensible qualities were (potentially) infinitely divisible, then, insofar as they necessarily inhere in matter as an extended magnitude, in order to exist, then even (potentially) infinitely small magnitudes would have to be perceptible, something which is, again, unacceptable[671].

After presenting this argument, however, Aristotle introduces the two main arguments in favour of the view that sensible qualities are (potentially) infinitely divisible. Both of them are *reductiones ad absurdum*. Simplifying matters significantly, it could be claimed that the first of these two arguments is ontological in nature, while the second one is epistemological. The first one (cf. *De sensu* 6, 445b11-15) is that according to which if sensible qualities were not (potentially) infinitely divisible (*per accidens*), then there would be portions of matter completely deprived of sensible qualities. What is more, material substances would ultimately be composed of non-sensible entities, therefore of mathematical ones, something which is evidently false[672]. The second one

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[671] ARISTOTELES, *De sensu* 6, 445b7-11, ed. ROSS: "ποιητικὸν γάρ ἐστιν ἕκαστον αὐτῶν τῆς αἰσθήσεως (τῷ δύνασθαι γὰρ κινεῖν αὐτὴν λέγεται πάντα), ὥστ᾽ἀνάγκη, εἰ ἡ δύναμις, καὶ τὴν αἴσθησιν εἰς ἄπειρα διαιρεῖσθαι καὶ πᾶν εἶναι μέγεθος αἰσθητόν (ἀδύνατον γὰρ λευκὸν μὲν ὁρᾶν, μὴ ποσὸν δέ)." Translatio vetus, ed. PEETERS: "Operativum enim sensus unumquodque illorum; in eo enim quod possunt movere ipsum, dicuntur omnia. Quare necessarium sensum in infinita dividi et omnem magnitudinem esse sensibilem. Impossibile enim album quidem videre et tantum." Translatio nova, ed. GAUTHIER, p. 76: "actiuum enim est unumquodque ipsorum sensus (in eo enim quod possunt mouere illum dicuntur omnia), quare necessarium sensum in infinita diuidi, et omnem magnitudinem esse sensibilem. Inpossibile enim album quidem uidere, non quantum autem."

[672] ARISTOTELES, *De sensu* 6, 445b11-15, ed. ROSS: "εἰ γὰρ μὴ οὕτως, ἐνδέχοιτ᾽ἂν εἶναί τι σῶμα μηδὲν ἔχον χρῶμα μηδὲ βάρος μηδ᾽ἄλλο τι τοιοῦτον πάθος, ὥστ᾽οὐδ᾽αἰσθητὸν ὅλως· ταῦτα γὰρ τὰ αἰσθητά. τὸ ἄρ᾽αἰσθητὸν ἔσται συγκείμενον οὐκ ἐξ αἰσθητῶν. ἀλλ᾽ἀναγκαῖον· οὐ γὰρ δὴ ἔκ γε τῶν μαθηματικῶν." Translatio vetus, ed. PEETERS: "Si enim non sic, oportet utique esse corpus nullum habens colorem nec gravedinem nec aliam talem passionem; quare omnino nec sensibile; hec enim sunt sensibilia. Sensibile ergo erit compositum non ex sensibilibus. Sed necesse. Non enim a mathematicis." Translatio nova, ed.

(cf. *De sensu* 6, 445b15-17) is that if sensible qualities were not infinitely divisible, then there would exist bodies in the natural world which could not be perceived by the senses, yet, at the same time, they could not be cognised by the intellect, insofar as the intellect only cognises what exists outside of it through sense perception, and, as a result, such bodies would lie completely outside of human cognition, something which goes against a fundamental tenet of Aristotle's epistemology[673].

Aristotle is clearly aware of the fact that the arguments presented in favour of both positions are convincing, so that no solution could be easily defended against possible objections. That this is so is evident from the fact that he notes, at this point (cf. *De sensu* 6, 445b17-20), that it might seem that the position of the atomists is a suitable solution to the issue of the infinite divisibility of sensible qualities: by denying the presupposition of the (potential) infinite divisibility of matter and by admitting, therefore, the existence of indivisible magnitudes, the *aporia* does not even arise. Nevertheless, Aristotle notes that the atomists' position has already been refuted "in those books concerning movement", which is a clear reference to the last three Books of the *Physics* and, in particular, to *Physics* VI (especially to *Physics* VI.1, 231a21-232a22, a text discussed in detail in the first chapter of this thesis).

It is only at this point that Aristotle starts to provide his solution to the *aporia* of the (potential) infinite divisibility of sensible qualities. Interestingly, the first thing he remarks is that the problem of the (potential) infinite divisibility of sensible qualities is not limited to the issue of the infinite divisibility of sensible qualities according to the (potential) infinite divisibility of the matter in which they inhere (*per accidens*). There is also a separate issue concerning the infinite divisibility of sensible qualities *per se*, that is, in species within each of their genera (445b20-22). This is a problem that Aristotle had previously raised in the text of the *De sensu* (cf. 440b23-25), to which he now returns in order to discuss in a more organic way the issue of the infinite divisibility of sensible

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GAUTHIER, p. 76: "Si enim non sic, utique continget esse aliquod corpus nullum habens colorem neque grauedinem nec aliam talem passionem, quare nec omnino sensibile: hec enim sensibilia sunt. Sensibile igitur erit compositum nec ex sensibilibus. Set necesse: non enim ex mathematicis."

673 ARISTOTELES, *De sensu* 6, 445b15-17, ed. ROSS: "ἔτι τίνι κρινοῦμεν ταῦτα καὶ γνωσόμεθα; ἢ τῷ νῷ; ἀλλ᾽οὐ νοητά, οὐδὲ νοεῖ ὁ νοῦς τὰ ἐκτὸς μὴ μετ᾽αἰσθήσεως." Translatio vetus, ed. PEETERS: "Amplius cui adiudicabimus hec cognoscenda nisi menti? Sed non intelligibilia, nec sentit mens que exterius intelligibilia sine sensu." Translatio nova, ed. GAUTHIER, p. 76: "Amplius cui adiudicabimus hec aut cognoscemus, nisi intellectui? Set non intelligibilia: nec enim intelligit intellectus que exterius nisi cum sensu."

qualities. To be precise, Aristotle notes that the solution of the issue of the infinite divisibility *per accidens* of sensible qualities will also allow to solve the issue of their infinite divisibility *per se* (445b20-22). This is a difficult statement to which I cannot devote enough attention here, since it lies outside the scope of the thesis. Indeed, what is important to remark here is that both Alexander of Aphrodisias and Medieval Latin commentators on *De sensu* 6, contrary to Aristotle's claim, perceived this issue as autonomous from that of the infinite divisibility *per accidens* of sensible qualities, although as strictly connected. Therefore, they invariably chose to discuss it as a preliminary issue to that of the infinite divisibility *per accidens* of sensible qualities. Nevertheless, this does not mean that commentators merely repeated Aristotle's solution to the issue of the infinite divisibility *per se* of sensible qualities. Indeed, the argument introduced by Aristotle to support his solution to the issue of the infinite divisibility *per se* of sensible qualities (cf. 445b22-27) was soon felt inadequate by commentators, so that already in Alexander it is possible to find an important original argument (one concerning the inequality of infinites) in support of Aristotle's solution. This argument was sometimes quoted by Medieval Latin commentators, especially by Radulphus Brito and John of Jandun. Other commentators, in particular John Buridan and an anonymous commentator identified both with Nicole Oresme and Albert of Saxony, nevertheless, also connected the debate concerning the infinite divisibility of sensible qualities in species within genera to that of the infinite divisibility of sensible qualities in degrees within species, an issue of great importance to Medieval Latin natural philosophy, but completely absent from the text of *De sensu* 6.

After providing his solution to the issue of the infinite divisibility *per se* of sensible qualities, Aristotle turns to the solution of the *aporia* concerning the infinite divisibility *per accidens* of sensible qualities. As a preliminary remark, Aristotle notes (445b27-28) that a continuous entity (such as the matter in which sensible qualities inhere) is (potentially) divisible in an infinite number of unequal parts, but only in a finite number of equal parts. A line of 4 metres, for instance, can only be divided in four parts of 1 meter each, or in two parts of 2 metres each, but it can be (potentially) infinitely divided in halves. This distinction features prominently in *Physics* VIII.8, 263a4-b9. The fact that Aristotle deems it relevant to mention it here (but not in contexts related to the issue of *minima naturalia*) is additional evidence in support of the observation that *De*

sensu 6 is the only text in the Aristotelian *corpus* where the issue of *minima* is thoroughly discussed. Moreover, Aristotle goes on to explicitly note that the forms of sensible qualities, instead, such as all forms, are not (potentially) infinitely divisible in species within genera (445b28-29), as he has just proved. To put it in other words, Aristotle is keen in attributing the property of (potential) infinite divisibility only to the matter of material substances as an extended magnitude and not to the sensible qualities associated with it, as discrete accidental forms.

Yet, as he goes on to note, the problem of the infinite divisibility *per accidens* of sensible qualities arises exactly because sensible qualities exist in a continuous magnitude (445b29)[674].

Only at this point Aristotle introduces his solution to the issue of the infinite divisibility *per accidens* of sensible qualities, resorting to a fundamental conceptual couple, that of potency and act. Although I have already quoted this passage in the previous chapter of this thesis, given its importance for Medieval Latin commentaries on *minima naturalia*, I quote it again here in order to discuss it in more detail:

> we must take account of the difference between the Potential and the Actual. It is owing to this difference that we do not [actually] see its ten-thousandth part in a grain of millet, although sight has embraced the whole grain within its scope; and it is owing to this, too, that the sound contained in a quarter-tone escapes notice, and yet one hears the whole strain, inasmuch as it is a continuum; but the interval between the extreme sounds [that bound the quarter-tone] escapes the ear [being only potentially audible, not actually]. So, in the case of other objects of sense, extremely small constituents are unnoticed; because they are only potentially not actually [perceptible e.g.] visible, unless when they have been parted from the wholes. So the

[674] Aurélien Robert has suggested a brilliant interpretation on how the remarks concerning the infinite divisibility *per se* of sensible qualities and those concerning the divisibility of matter as an extended magnitude into equal and unequal parts at 445b20-29 can be squared together in a single theoretical framework: "I suggest reading this argument in the following way: 1) there cannot be an infinity of species of sensible qualities in a finite body; so even if all the possible species of qualities were instantiated in a finite body, there would be only a finite number of colours, smells, etc. in it; 2) if actual parts of the sensible have a determinate quantity, corresponding to a certain degree between a *minimum* and a *maximum*, then the whole quality can only be divided into a finite number of these equal parts in the same way as a ten centimetre ruler can be divided into no more than ten units of one centimetre. As a consequence, the number of sensible qualities in a body is limited and each sensible quality – taken as a whole – is potentially divisible into a finite number of actual – and equal – parts though it continues to be potentially divisible into an infinity of unequal part[s] as regards to the quantity of its subject." (ROBERT, "John of Jandun on *Minima Sensibilia*", *op. cit.*, pp. 376-377). Although this interpretation makes perfect sense of the Aristotelian text, it is interesting to note, as I have remarked above, that both Alexander of Aphrodisias and all Medieval Latin commentators I am aware of kept the two issues of the infinite divisibility *per se* of sensible qualities and of the divisibility of continuous magnitudes into equal and unequal parts distinguished (although they had quite a lot to say concerning the relation between division of matter into equal and unequal parts).

> footlength too exists potentially in the two foot-length, but actually only when it has been separated from the whole[675].

Aristotle's idea is that when we perceive the sensible qualities of a given material substance, we perceive them as a whole. For instance, when perceiving the colour of a stone, we perceive the colour of all the portions of the stone that we are able to see from our point of view. In this sense, it is certainly possible to say that we perceive the colour of *all* the parts of the stone lying within our visual field, no matter how small they are. Nevertheless, our sight is not so strong as to be able to "focus", so to speak, on the colour of extremely small parts of the stone considered in isolation. In this sense, Aristotle claims that the colour of all the parts of the stone, no matter how small, is potentially perceptible insofar as it is present in the actual perception of the overall colour of the stone. If, however, an extremely small part of the stone were separated from it, its colour would become a new perceptual whole, and, as a result, it would become perceptible in actuality. In this sense, therefore, the notion of 'potentially perceptible' in the passage becomes

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[675] ARISTOTELES, *De sensu* 6, 445b30-446a7, ed. ROSS: "ληπτέον ὅτι τὸ δυνάμει καὶ τὸ ἐνεργείᾳ ἕτερον· καὶ διὰ τοῦτο τὸ μυριοστημόριον λανθάνει τῆς κέγχρου ὁρωμένης, καίτοι ἡ ὄψις ἐπελήλυθεν, καὶ ὁ ἐν τῇ διέσει φθόγγος λανθάνει, καίτοι συνεχοῦς ὄντος ἀκούει τοῦ μέλους παντός· τὸ δὲ διάστημα τὸ τοῦ μεταξὺ πρὸς τοὺς ἐσχάτους λανθάνει. ὁμοίως δὲ καὶ ἐν τοῖς ἄλλοις αἰσθητοῖς τὰ μικρὰ πάμπαν· δυνάμει γὰρ ὁρατά, ἐνεργείᾳ δ᾽οὔ, ὅταν μὴ χωρὶς ᾖ· καὶ γὰρ ἐνυπάρχει δυνάμει ἡ ποδιαία τῇ δίποδι, ἐνεργείᾳ δ᾽ἤδη ἀφαιρεθεῖσα." Translatio vetus, ed. PEETERS: "sumatur autem quod virtute et actione aliud. Et propter hoc decimum millesimum milii fallit visi, quamvis visus superveniat. Et qui in diesi sonus fallit, quamvis continuus existens auditur omnis cantus; distancia vero interexistentis ad ultima fallit. Similiter autem et in aliis sensibilibus parva omnino; virtute namque visibilia, actione vero non, quando separata non sunt. Etenim inest virtus gressibilis bipedi actione separata." Translatio nova, ed. GAUTHIER, p. 76: "sumendum quia quod potencia et quod actu aliud. Et propter hoc decimum millesimum milii latet uisum, quamuis uisus superueniat. Et qui in dyesi sonus latet, quamuis continuus existens auditur omnis cantus; distancia uero inter existentis ad ultima latet. Similiter autem et in aliis sensibilibus parua omnino: potencia namquae visibilia ipsa, actu autem non, quando non separaverit; et enim inest potencia que pedalis bipedi, actu itaque divisa." Note that the *diesis* seems to be interpreted in this passage by Aristotle as the smallest interval of a melody that is perceptible in actuality. If this interpretation is correct, Aristotle's understanding of the *diesis* in this context is rather unorthodox, insofar as, by characterising it as the smallest interval of a melody that is perceptible in actuality, Aristotle clearly interprets the *diesis* as a much smaller interval than the semitone of diatonic music. For an analysis of this aspect, treated in connection with ancient Greek musical theory, see especially F. PELOSI, *Aristotele,* De sensu *III, VI, VII: la percezione del suono e la consonanza nella musica greca*, in *Quaderni Urbinati di Cultura Classica*, n.s. 84, 3, 2006, pp. 27-60, pp. 28-33, and A. BÉLIS, *Aristoxène de Tarente et Aristote: le traité d'harmonique*, Paris, Klincksieck, 1986, p. 70. Aristotle's conception of the *diesis*, moreover, introduces an important asymmetry between the two examples of the millet seed and of the melody: while, indeed, the reference to the ten-thousandth part of the millet seed does not allow to identify any specific smallest part of the millet seed that is perceptible in actuality (not more than a reference to the nine-thousandth or the eleven-thousandth part of it would have), the reference to the *diesis*, as interpreted by Aristotle, does. This asymmetry, as I will show below, will be used by at least one Medieval Latin *De sensu* commentator, Albert the Great, to develop his own peculiar doctrine of *minima sensibilia*.

twofold. On the one hand, the sensible qualities associated with a portion of matter existing within the whole of the material substance to which they belong are potentially perceptible insofar as they are present in the actual perception of the sensible qualities of the material substance as a whole. On the other hand, they are potentially perceptible insofar as, if the portion of matter to which they are united were separated from the whole to which it belongs, they would come to form a new whole, therefore becoming perceptible in act.

This picture, however, raises an immediate problem for Aristotle. Indeed, as he has argued at the beginning of the discussion on *minima sensibilia*, given the limitations of the sensory powers of the external senses, if extremely small portions of matter were separated from the whole to which they belong their sensible qualities would not be able to act on the senses, and therefore they would not become perceptible in act (and, moreover, matter would risk being, at least in principle, infinitely divisible in act). How, then, can Aristotle solve this conundrum? The solution lies in the claim he makes just afterwards, namely, that the problem does not even arise, because if extremely small portions of a given material substance were to exist separately from it, they would be immediately corrupted by the containing medium, so as to lose (together with their substantial form) their sensible qualities and to acquire those of the medium itself (446a7-10)[676]. Far from being able to be perceived in act when separated from the whole to which they belong, the sensible qualities united with extremely small portions of matter would not even be able to *exist* in act when separated from the whole to which they belong (and, as a result, matter itself would not be infinitely divisible in act). Aristotle's example, which would remain the canonical one in the Late Ancient and Medieval Latin commentary tradition, is that of an extremely small portion of flavour poured into the sea (this example parallels that of a drop of wine poured into the sea in *De generatione* I.10).

As a result, as I have stated in the introduction to this chapter, Aristotle's solution to the issue of the infinite divisibility *per accidens* of sensible qualities seems to be based on the idea that the threshold of perceptibility of the sensible qualities of matter is equal

[676] ARISTOTELES, *De sensu* 6, 446a7-10, ed. ROSS: "χωριζόμεναι δ᾽αἱ τηλικαῦται ὑπεροχαὶ εὐλόγως μὲν ἂν καὶ διαλύοιντο εἰς τὰ περιέχοντα, ὥσπερ καὶ ἀκαριαῖος χυμὸς εἰς τὴν θάλατταν ἐγχυθείς." Translatio vetus, ed. PEETERS: "Separatis igitur tunc superhabundantiis rationabiliter et resolvuntur in continentia, velud subtilis chimus mari infusus." Translatio nova, ed. GAUTHIER, p. 76: "Separate autem tante superhabundancie rationabiliter quidem utique et resolvuntur in continencia, velud minimus sapor mari infusus."

(or inferio to) to the threshold required to matter in order for it (and, therefore, for its sensible qualities) to be able to resist to the corrupting action of the containing medium. It is only thanks to this principle that the sensible qualities united with portions of matter of a given material substance so small as to be imperceptible can never exist in act on their own, that is, separately from the whole to which they belong.

Aristotle, however, goes on to complicate this conceptual framework in an intricate but fundamental passage:

> But even if this were not so [i.e., that extremely small portions of matter would be corrupted by the action of the containing medium when separated from the whole to which they belong], still, since the excess of sense perception [required in order to perceive extremely small portions of matter] is not perceptible in itself, nor capable of separate existence (since it exists only potentially in the more distinctly perceptible whole of sense perception), so neither will it be possible to perceive in act its correlative perceptible when separated [from the whole to which it belongs]. But yet this [entity] will be perceptible: for it is both potentially so already [i.e., when existing on its own], and destined to be so in act when it has become part [of an aggregate][677].

Aristotle seems to be here resorting to a sort of thought experiment, in order to consider what would happen if the extremely small portions of matter subject to corruption by the containing medium could exist separately from the whole to which they belong preserving their sensible qualities, without being subject to the corrupting action of the containing medium. Even in this case, Aristotle claims, their sensible qualities would remain imperceptible. He provides the reason for this claim (which further specifies the argument against the infinite divisibility of sensible qualities he presented at the outset of his discussion on *minima sensibilia*) in the first part of the passage, after which he goes on to establish in what sense such sensible qualities could, nevertheless, be potentially perceptible.

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[677] ARISTOTELES, *De sensu* 6, 446a10-15, ed. ROSS: "οὐ μὴν ἀλλ᾽ἐπειδὴ οὐδ᾽ἡ τῆς αἰσθήσεως ὑπεροχὴ καθ᾽αὑτὴν αἰσθητὴ οὐδὲ χωριστή (δυνάμει γὰρ ἐνυπάρχει ἐν τῇ ἀκριβεστέρᾳ ἡ ὑπεροχή), οὐδὲ τὸ τηλικοῦτον αἰσθητὸν χωριστὸν ἔσται ἐνεργείᾳ αἰσθάνεσθαι. ἀλλ᾽ὅμως ἔσται αἰσθητὸν· δυνάμει τε γάρ ἐστιν ἤδη, καὶ ἐνεργείᾳ ἔσται προσγενόμενον." Translatio vetus, ed. PEETERS: "Necnon sed quoniam sensus superhabundantia secundum ipsam sensibilis nec separata (virtute enim inest in discretiori superhabundantia), nec tamen sensibile separatum erit actione sentiri, sed tamen erit sensibile. Virtute enim est iam, et actione erit ad perfectum." Translatio nova, ed. GAUTHIER, p. 76: "Quin immo quoniam neque sensus superhabundancia secundum ipsam sensibilis nec separata. Potencia enim inest in certiori superhabundancia, nec tantum sensibile separatum erit actu sentiri. Set tamen erit sensibile: potencia enim est iam, et actu erit adueniens."

The reason for the impossibility to perceive the sensible qualities associated with extremely small portions of matter when they exist separately from the whole to which they belong is that the "part" (so to speak) of the corresponding sensory power capable of discerning them can only exist together with the sensory power as a whole, and not on its own, as capable to engender a separate sensation (446a10-15). Therefore, only when sensible qualities are able to act on their corresponding sensory power considered as a whole, so as to engender a sensation in it and therefore to be discerned by it, can they be perceived in act. Still, the sensible qualities associated with extremely small portions of matter existing on their own cannot do so. Therefore, they can be perceived only when they contribute to the action of the sensible quality of the whole to which they belong on the sensory power as a whole, but not when existing on their own. Otherwise, indeed, it would be necessary to admit that we have the power to perceive the sensible qualities of (potentially) infinitely small portions of matter, something which contradicts the fundamental Aristotelian assumption, already quoted, that all powers in the natural world are finite.

After this first part of the passage, however, Aristotle inserts an observation that, starting with Alexander of Aphrodisias, would be used by commentators to develop a "corpuscularian" line of thought within the debate on *minima sensibilia*. Aristotle, indeed, claims that the extremely small portions of matter of a given material substance, although they cannot be perceived when separated from the whole to which they belong, are already potentially perceptible, and they will become perceptible in actuality by uniting with a sufficient quantity of matter endowed with the same sensible qualities (446a13-15)[678].

Evidently, here Aristotle is using the notion of potentially perceptible in yet another sense than the two I have detailed above. Indeed, Aristotle appears to claim that the sensible qualities of extremely small portions of matter (assuming that they could exist in act separate from the whole to which they belong) are potentially perceptible insofar as they could become perceptible in act by uniting with a sufficient quantity of matter endowed with the same sensible qualities.

[678] Note that, on this model, the only limit to the actual existence of portions of matter endowed with their own sensible qualities would be the limit to the divisibility of matter iteslf.

Trying to summarise, in Aristotle's text there are at least three different meanings according to which a sensible quality associated with a portion of matter of a given material substance is said to be potentially perceptible (although they are not explicitly distinguished)[679]:

1. A sensible quality associated with a portion of matter of a given material substance is said to be potentially perceptible insofar as it contributes to the actual perception of the whole sensible quality of such a material substance.
2. A sensible quality associated with a portion of matter of a given material substance is said to be potentially perceptible insofar as it would become actually perceptible if such a portion of matter were separated from the whole to which it belongs.
3. A sensible quality associated with a portion of matter of a given material substance is said to be potentially perceptible insofar as it would become actually perceptible if such a portion of matter were united with a sufficiently great quantity of matter endowed with the same sensible quality.

Although Aristotle does not develop any further his brief remark concerning the third (and obviously most problematic) meaning of potentially perceptible, and although such remark is part of a convoluted thought experiment, it is sufficiently clear from it that Aristotle himself was fully conscious of the difficulties inhering in his belief in the

[679] The existence of three different meanings of 'potentially perceptible' in the text of the *De sensu* 6 had already been noted by Richard Sorabji, and the same distinction has also been noted by Aurélien Robert. The three meanings I list here are fundamentally the same proposed by Sorabji and Robert (although in their list the third meaning which I list here is the first). As Sorabji puts it: "In Chapter 6, 445b27-446a20, Aristotle distinguishes between actual and potential imperceptibility of colour patches and shade variations, and similarly for notes and pitches and other perceptible qualities. But perceptibility also has different meanings. There seem to be three levels. First a very small patch, if separated, is either dissolved (446a8), or at best potentially perceptible. Secondly, if joined to a larger whole it becomes actually perceptible, but in a weak sense of perceptible, namely because it is in the perceptible whole (ὅτι ἐν τῷ ὅλῳ, 446a18). Since even a sizeless point can be in a perceptible whole, but is implied not to be perceptible by the argument of 7, 449a20-31, Aristotle probably means something stronger, perhaps that it contributes to the perceptibility of the larger whole. At 446a1, he says more modestly that sight has covered it (ἐπελήλυθεν). But there is, thirdly, a stronger sense of perceptibility in which something is perceptible separately (χωρίς, 446a18), and not merely because it is in the whole" (SORABJI, "Aristotle on Colour, Light and Imperceptibles", *op. cit.*, pp. 134-135). As Robert summarises the distinction: "Aristotle's arguments rest upon the idea that something can be sensible only potentially. But, as Richard Sorabji once remarked, there seem to be three distinct meanings of perceptibility in the *De sensu et sensato*, 6: 1) a small patch, if separated from the whole colour patch is dissolved, but remains potentially sensible; 2) if this small patch is joined to a larger colour patch, it becomes potentially perceptible as a part of the whole; 3) something can be actually perceptible separately, *in se* and not because of the whole to which it belongs" (ROBERT, "John of Jandun on *Minima Sensibilia*", *op. cit.*, pp. 377-378).

coextension of the sensible world and of the perceptible one, a principle to which I have already referred in the introduction to the chapter. These difficulties, as I will show in this chapter and in the next one, will lead Alexander of Aphrodisias and the Medieval Latin commentators influenced by him progressively away from such a principle.

3.3. Alexander of Aphrodisias on *Minima sensibilia*: The Development of the Third Meaning of 'Potentially Perceptible'

Alexander of Aphrodisias' commentary on the *De sensu* is the only Late Ancient commentary on this Aristotelian work that has been preserved (and also the only one to have reached the Latin Middle Ages)[680]. Its importance lies not only in its originality and depth of analysis, but also in its momentous reception in the Medieval Latin world, starting just after William of Moerbeke's translation, which can be safely dated to 1260[681]. It is therefore all the more important to analyse Alexander's commentary on the issue of *minima sensibilia* in some detail in what follows.

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[680] Alexander's commentary has been critically edited in the *Commentaria in Aristotelem Graeca* series as ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium*, ed. P. WENDLAND, Berlin, Reimer, 1901. There is at least another Late Ancient *De sensu* commentary of which we are aware that, however, has not been preserved, i.e., Aspasius' commentary, to which Alexander refers once in his own *De sensu* commentary (cf. ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium*, ed. WENDLAND, 10.1-2). As to the possible existence of other Late Ancient commentaries to the text, we are in the dark, save for another problematic reference made by Alexander himself, who once, again in his *De sensu* commentary, speaks of a plurality of previous commentators on the *De sensu*. This reference, however, must be treated carefully. As Börye Bydén rightly claims in his introduction to the important recent collective volume he co-edited concerning the Greek, Arabic and Latin reception of the *Parva naturalia*: "Alexander also once refers to previous commentators on the *De sensu* in the plural (*In De sensu*, 82.16-17), but this need not be taken to imply that there were more than the one by Aspasius (cf. Moraux 1984 [cf. P. MORAUX, *Der Aristotelismus bei den Griechen von Andronikos bis Alexander von Aphrodisias, Vol. 2. Der Aristotelismus im I. und II. Jh. N. Chr.*, Berlin-New York, NY, de Grutyer, 1984], 244-246)" (B. BYDÉN, *Introduction: The Study and Reception of Aristotle's* Parva naturalia, in B. BYDÉN, F. RATOVIC (eds.), *The* Parva naturalia *in Greek, Arabic and Latin Aristotielianism: Supplementing the Science of the Soul (Studies in the History of Philosophy of Mind 17)*, Dordrecht, Springer, 2018, pp. 1-50, here p. 12, n. 33.

[681] A critical edition of Moerbeke's translation, after the initial work on it by Willy Vanhamel and Carla Di Martino, is in preparation by Lisa Devriese, whom I wholeheartedly thank for having shared with me a preliminary version of the text. The following quotations of Moerbeke's translation are taken from C. THUROT, *Notices et extraits des manuscrits de la Bibliothèque nationale et autres bibliothèques 25/2*, Paris, Imprimerie Nationale, 1875, where, on pp. 5-367, the author includes a transcription of one of the four extant manuscript witnesses of Moerbeke's translation, namely, ms. Paris, Bibliothèque nationale de France, Lat. 14714, ff. 97r-116v (which, unfortunately, does not present a good version of the text). For a limited comparison between Moerbeke's translation and the Greek text edited by Wendland, together with a doctrinal analysis of some of the issues of the text, see C. DI MARTINO, *Le* Commentaire du De sensu *par Alexandre d'Aphrodise*, in GRELLARD, MOREL (eds.), *Les* Parva naturalia *d'Aristote. Fortune antique et médiévale*, *op. cit.*, pp. 77-100.

Alexander's commentary on the issue of *minima sensibilia* is rather extended, therefore I do not aim to present all the aspects of his account here. What I aim to do is merely to show the main lines of his interpretation, especially those which will have an afterlife in the Medieval Latin debate.

First of all, it must be remarked that Alexander fundamentally agrees with the solution to the issue of *minima sensibilia* presented by Aristotle. He does not deny that sensible qualities are always (potentially) perceptible insofar as they are associated with portions of matter belonging to a material substance which is actually perceived, and that, if separated from it, they would either become sensible in act (if associated with sufficiently great portions of matter) or be corrupted by the action of the containing medium (if associated with smaller portions of matter). Alexander, however, refines, deepens, and takes into a new direction Aristotle's solution, by distinguishing the three meanings of potentially perceptible present in the Aristotelian text more thoroughly and, more importantly, by significantly developing the third meaning mentioned above, which, as said, in Aristotle's text constituted only an isolated remark.

In what follows I will therefore look in more detail at the way in which Alexander discusses such meaning of potentially perceptible. Alexander introduces the discussion of the third meaning of 'potentially perceptible' by referring to Aristotle's problematic claim at 446a13-15 that extremely small portions of matter of a given material substance, although they cannot be perceived when separated from the whole to which they belong, are already perceptible in potency, and they will become perceptible in act by uniting with the whole to which they belong:

> Nevertheless, even if [the ten-thousandth part of the millet seed] were not destroyed but remained, not even thus would it be actually perceptible, but even at that time [it would be] potentially [perceptible]. For all the parts which are in wholes, so long as they are in wholes, are potentially but not actually perceptible. For this is how the parts of the whole possess their being. On this view those parts that are sufficiently small to escape perception because of smallness, even when they have been separated from the wholes, preserve their potentially [being perceptible], being perceptible and possessing the affection as far as their own nature is concerned (for they were perceptible in the whole; at any rate sight [will encounter them], even if [it does not see them] on their own), but escaping perception because of smallness. What is responsible for this is the fact that the excess of the perception is not perceptible on its own, that is not every part of the perceptible is perceptible on its own[682].

[682] ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium*, ed. WENDLAND, 118.6-15: "Οὐ μὴν ἀλλ᾽εἰ καὶ φθείροιτο, ἀλλὰ μένοι, οὐδ᾽οὕτως ἂν εἴη ἐνεργείᾳ αἰσθητόν, ἀλλὰ καὶ τότε δυνάμει· πάντα μὲν

Alexander clearly takes (rightly, I believe) the Aristotelian remark to be a sort of thought experiment, in which Aristotle considers what would happen to the sensible qualities of extremely small portions of matter separated from the whole to which they belong in case they were not destroyed by the corrupting action of the containing medium. His interpretation, in line with what Aristotle had stated, is that they will not be perceptible, although they will still possess their sensible qualities. In the last sentence of the passage quoted, moreover, Alexander explains this fact, in accordance with Aristotle, by referring to the inability of these extremely small portions of matter existing on their own (called 'the excess of the perception') to engender a sensation in the corresponding sensory power, which is always affected as a whole.

Alexander, however, complicates Aristotle's picture in this respect. Indeed, he provides two alternative interpretations of what an 'excess of the perception' is. The first one, which is certainly the weaker one, takes an 'excess of the perception' to be "that which is actually <perceptible>" (118, 17). More precisely, as Alexander goes on to say, an excess of the perception is the perception of an excess of the perceptible, and "[a]n excess of the perceptible would be a part such that what is left at its removal still remains actually perceptible" (118, 17-18). The idea seems to be that an excess of the perception is every "part" of a sensible whole such that, if it were separated from the whole to which it belongs, would still be actually perceptible (and, correlatively, the whole to which it

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γὰρ τὰ ἐν τοῖς ὅλοις μέρη, ἔστ᾽ ἂν ἐν τοῖς ὅλοις ᾖ, δυνάμει ἐστὶν αἰσθητὰ καὶ οὐκ ἐνεργείᾳ· καὶ γὰρ τὰ μέρη τοῦ ὅλου οὕτως ἔχει τὸ εἶναι. οὕτω δὲ καὶ τῶν μορίων τὰ τηλικαῦτα, ὡς διὰ μικρότητα διαφεύγειν τὴν αἴσθησιν, καὶ χωρισθέντα τῶν ὅλων φυλάσσει τὸ δυνάμει, ὅσον μὲν ἐπὶ τῇ αὑτῶν φύσει αἰσθητὰ ὄντα καὶ ἔχοντα τὸ πάθος (καὶ γὰρ ἐν τῷ ὅλῳ ὄντα αἰσθητὰ ἦν, † ἐπεὶ οὖν ἡ ὄψις, εἰ καὶ μὴ καθ᾽ αὑτά), διὰ δὲ σμικρότητα τὴν αἴσθησιν διαφεύγοντα. τούτου δὲ αἴτιον, ὅτι ἡ ὑπεροχὴ τῆς αἰσθήσεως οὐ καθ᾽ αὑτὴν αἰσθητή, τουτέστιν οὐ πᾶν μόριον τοῦ αἰσθητοῦ αἰσθητόν ἐστι καθ᾽ αὑτό." ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium. Translatio moerbekana*, in THUROT, *Notices et extraits des manuscrits de la Bibliothèque nationale et autres bibliothèques, Vol. 25/2*, *op. cit.*, p. 247, l. 7-p. 248, l. 5: "Quin ymo sed si non corrumpantur permaneant, neque sic utique erit actu sensibile, sed et tunc potentia. Omnes quidem enim que in totis partes, erunt utique in totis aut potentia sunt sensibiles et non actu; et enim partes tocius sic habent esse. Sic autem et partium tantille ut propter parvitatem diffugiant sensum, et separate a totis, servabunt potentia, quantum quidem in sua natura sensibilia existentia et habentia passionem (et enim in toto existentia sensibilia erant, quoniam igitur visus, et si non secundum se), propter parvitatem autem sensum diffugientia. Huius autem causa quod excellentia sensus non secundum se sensibilis, hoc est non omnis pars sensibilis sensibile est secundum se." Note that for all the quotations from Alexander's commentary, I have used, albeit in a slightly modified form, the English translation provided by Alan Towey in ALEXANDER OF APHRODISIAS, *On Aristotle on Sense Perception*, TOWEY (trans.), *op. cit.*, here p. 110).

belongs would remain actually perceptible after the separation). This interpretation is original and acute, nevertheless it does not allow to appropriately capture the meaning of the 'excess of the perception' in Aristotle's text. Indeed, one could object that the excess of the perception as defined by Alexander applies to the portions of a given material substance great enough to remain actually perceptible on their own, once separated from the whole to which they belong, therefore resisting to the corrupting action of the containing medium. But this is not possible, since Aristotle (and Alexander, in the last sentence of the passage quoted above, seems to endorse this claim) clearly states that the excess of the perception cannot subsist on its own, that is, it cannot be capable of producing a sensation on its own.

Alexander is probably conscious of this objection, since he goes on to provide a second interpretation of what an 'excess of the perception' is for Aristotle:

> Alternatively what is being said is as follows: for just as the more accurate perception predominates over the less accurate by a certain perceptive potentiality (for the excess of the more accurate perception is not by virtue of anything other than a perceptive potentiality), whereas the excess itself, when it comes about, is not in itself a perception (he said 'perceptible' (*aisthete*) in the sense of 'perceptive' (*aisthetike*): for if [there is] some [sense] possessing a potentiality as great as is the perceptive excess in the more accurate perception it would not already be able to perceive. However it will increase the perception by the addition. For the excess is present potentially in the more accurate perception, and it is a perception potentially, but not so as to be a perception on its own if separated), so too some of the parts in perceptibles are like this, being in the whole, potentially perceptible, so that when they are in the whole they make some contribution to it for its being perceptible but when they are separated and come to be on their own they are not perceptible, because of an excess. For he would describe as an excess of a perception the [excess] which comes about in the more accurate [perception] in contrast with the less accurate one. For the more accurate perception sees something to a greater extent, not in such a way that, by surpassing in accuracy, it fails to see it in the same way, but [merely seeing it] more accurately[683].

[683] ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium*, ed. WENDLAND, 118.23-119.10: "Ἢ τὸ λεγόμενον τοιοῦτόν ἐστιν· ὡς γὰρ ἡ ἀκριβεστέρα αἴσθησις ὑπερέχει τινὶ δυνάμει αἰσθητικῇ τῆς ἧττον ἀκριβοῦς (οὐ γὰρ κατ᾽ἄλλο τι ἡ ὑπεροχὴ τῆς ἀκριβεστέρας αἰσθήσεως ἢ κατὰ δύναμιν αἰσθητικήν), οὐ μὴν καθ᾽αὑτὴν ἡ ὑπεροχὴ αὐτὴ γινομένη αἴσθησίς ἐστι (τὸ γὰρ αἰσθητὴ εἶπεν ἀντὶ τοῦ αἰσθητική· οὐ γὰρ εἴ τις τοσαύτην ἔχουσα δύναμιν, ὅση ἐστὶν ἡ αἰσθητικὴ ὑπεροχὴ ἐν τῇ ἀκριβεστέρᾳ αἰσθήσει, ἤδη καὶ αἰσθάνεσθαι ἂν δύναιτο· καίτοι αὔξει τὴν αἴσθησιν τῇ προσθήκῃ· δυνάμει γὰρ ἐν τῇ ἀκριβεστέρᾳ αἰσθήσει ἡ ὑπεροχὴ ἐνυπάρχει, καὶ ἔστιν αἴσθησις δυνάμει, ἀλλ᾽οὐχ οὕτως ὥστε καὶ χωρισθεῖσα καθ᾽αὑτὴν αἴσθησις εἶναι), οὕτως καὶ ἐν τοῖς αἰσθητοῖς ἔνια τῶν μορίων οὕτως ἐστίν, ἐν τῷ ὅλῳ ὄντα, δυνάμει αἰσθητά, ὡς ὄντα μὲν ἐν τῷ ὅλῳ συντελεῖν τι αὐτῷ πρὸς τὸ αἰσθητῷ εἶναι, χωρισθέντα μέντοι καὶ καθ᾽ἑαυτὰ γινόμενα μὴ εἶναι αἰσθητὰ δι᾽ὑπεροχήν. <ὑπεροχὴν> γὰρ καὶ αἰσθήσεως λέγοι ἂν καὶ τὴν ἐν τῇ ἀκριβεστέρᾳ γινομένην πρὸς τὴν ἧττον ἀκριβῆ. ὁρᾷ μὲν γάρ τι πλέον ἡ ἀκριβεστέρα αἴσθησις, ἀλλ᾽οὐχ οὕτως ὡς ὑπερβάλλουσα οὐχ ὁμοίως αὐτὸ οὐχ ὁρᾶν τῇ ἀκριβείᾳ, ἀλλ᾽ἀκριβέστερον." ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium. Translatio moerbekana*, in THUROT, *Notices et extraits des manuscrits*

The second interpretation provided by Alexander is perfectly in line with the Aristotelian passage, at least as I expounded it in the previous section. The idea is that the excess of the perception is constituted by the sensible qualities of extremely small portions of matter, exactly those that, if they were separated from the whole to which they belong, would be corrupted by the containing medium (and therefore also those that Alexander considers as potentially sensible in the third meaning), and, correlatively, also by the "part of" the sensory power capable of perceiving them. In this sense, Alexander establishes a precise analogy between what happens to the sensible qualities of extremely small parts of the sensible and to the corresponding "parts" of the sensory power which perceives them. Such as the relevant part of the sensible is not able to subsist on its own once separated from the whole to which it belongs (and even if it did, it would not be actually perceptible, because it would not be able to engender a sensation in the corresponding sensory power as a whole), so too the corresponding "parts" of the sensory power would not be able to subsist in isolation, if they were separated from the whole of it, and even if they could, they would not be able to perceive[684].

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de la Bibliothèque nationale et autres bibliothèques, Vol. 25/2, *op. cit.*, p. 248, l. 12-p. 250, l. 3: "Aut quod dicitur tale est: sicut enim subtilior sensus excedit aliqua potentia sensitiva minus subtilem (non enim secundum aliud aliquid excessus subtilioris sensus, quam secundum potentiam sensitivam), non tamen secundum ipsum excessus factus sensus est (– "sensibili" enim dixit pro sensitivo – non enim si quis tantam habens potentiam, quantus est excessus in subtiliori sensu, iam et sentire utique potest), et si augeat sensum appositione (potentia enim in subtiliori sensu excellentia inexistit, et est sensus potentia, sed non sic ut sit separatur secundum se sensus), sic et in sensibilibus quedam partium sic sunt, in toto entes, potentia sensibiles, ut existentes quidem in toto conferant aliquid ipsi ad hoc quod sensibile sit, separate tamen secundum se facte non sint sensibiles. Propter excessum enim et sensum dicet utique et subtiliorem factum utique ad minus subtilem. Videt enim plus subtilior sensus, sed non hoc ut excedens non similiter non videt ipsum perspicacia, sed diligentius." For the English translation, see ALEXANDER OF APHRODISIAS, *On Aristotle on Sense Perception*, TOWEY (trans.), *op. cit.*, p. 111.

[684] "He showed what he set out to show very effectively by using the excess of the perception and showing the similarity between them. For just as the excess of the more accurate perception contributes to the perception for the person who possesses it and is not a perception when separated and on its own, so the sufficiently small part of the perceptible will not be perceptible on its own when separated, but will be perceptible in the same way as it was when was it was in the whole. For at that time it was potentially [perceptible]. In the same way the excess of the more accurate perception when taken on its own is [only] potentially a perception because it comes to be a perception when some other potentiality is added" (ALEXANDER OF APHRODISIAS, *On Aristotle on Sense Perception*, TOWEY (trans.), *op. cit.*, p. 111). ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium*, ed. WENDLAND, 119.10-18: "λίαν δὲ ἀνυσίμως ἔδειξε τὸ προκείμενον τῇ τῆς αἰσθήσεως ὑπεροχῇ χρησάμενος καὶ τὴν ὁμοιότητα δείξας αὐτῶν. ὡς γὰρ ἡ ὑπεροχὴ τῆς ἀκριβεστέρας αἰσθήσεως συντελοῦσα εἰς τὴν αἴσθησιν τῷ ἔχοντι χωρισθεῖσα οὐκ ἔστιν αἴσθησις καθ᾽αὑτήν, οὕτως οὐδὲ τὸ τηλικοῦτον μόριον τοῦ αἰσθητοῦ χωρισθὲν ἔσται καθ᾽αὐτὸ αἰσθητόν, ἀλλ᾽ὁμοίως μὲν αἰσθητόν, ὡς ἦν καὶ ὅτε ἦν ἐν τῷ ὅλῳ· δυνάμει γὰρ καὶ τότε· οὕτως γὰρ ἡ ὑπεροχὴ τῆς ἀκριβεστέρας αἰσθήσεως καθ᾽αὑτὴν λαμβανομένη αἴσθησις δυνάμει τῷ προστεθείσης ἄλλης δυνάμεώς τινος αἴσθησις γίνεσθαι." ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium. Translatio moerbekana*, in THUROT, *Notices et extraits des manuscrits de la Bibliothèque nationale et*

Having clarified his interpretation along these lines, Alexander goes on to conclude that portions of matter which are potentially perceptible in the third meaning, as already hinted at by Aristotle, can become actually perceptible by being united with a sufficient quantity of matter (endowed with the same sensible qualities):

> However, it [i.e., a portion of matter potentially perceptible in the third meaning] will not be imperceptible and without affection just because it is not perceptible when separated and on its own. But it will be potentially perceptible when existing on its own. For it possesses perceptible affections but because of its smallness it has failed in its ability to move the sense on its own. But it will be actually perceptible when added to other similar [perceptibles]. For when these are collected ([perceptibles] which when they existed individually and separated were only potentially perceptible, being unable actually to move the sense because of weakness) and when there comes to be out of them [a perceptible] sufficiently large to be able to move [the sense], perception in actuality comes about by means of their being united. It depends not upon a quality in isolation but also upon the quantity of the potentiality whether the movement [generated] by the perceptible comes to be actually perceptible, not because either of [the perceptibles] is perceptible individually but because being put together they contribute to the whole that is [put together] out of them towards its being able to move the sense in actuality. And being in this way in the whole [they are] potentially perceptible, not because they are actually able ever to become [perceptible] on their own, but because they are parts. For they were parts of that which is perceptible on its own, and the potentiality of theirs in relation to perception, which they actually possess when separated, would be less important than the potentiality in virtue of which they were said to be potentially perceptible parts when they were in the whole. At that time the sense apprehends them in a way and is active concerning them, even if they would not be [perceptible] on their own if separated[685].

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autres bibliothèques, Vol. 25/2, op. cit., p. 250, ll. 3-9: "Valde autem ostendit propositum sensus excessu utens et similitudinem ostendens ipsorum. Sicut enim excessus subtilioris sensus conferens ad sensum separatus non est sensus, sic neque tanta pars sensibilis separata erit secundum se sensibilis, sed similiter quidem sensibilis, ut erat et quando erat in toto; potentia enim et tunc; sic enim subtilioris excessus secundum se acceptus sensus potentia, eo quod, apposita alia potentia aliqua, sensus fiat."

[685] ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium*, ed. WENDLAND, 119.18-120.11: "οὐ μήν, ἐπεὶ μὴ καθ᾽αὑτὸ αἰσθητόν ἐστι χωρισθέν, διὰ τοῦτο ἀναίσθητον καὶ ἀπαθὲς ἔσται· ἀλλ᾽ἔσται καθ᾽αὑτὸ ὂν δυνάμει αἰσθητόν· ἔχει μὲν γὰρ τὰ πάθη τὰ αἰσθητά, διὰ δὲ σμικρότητα ἐκπέπτωκε τοῦ καθ᾽αὑτὸ κινεῖν τὴν αἴσθησιν δύνασθαι. ἐνεργείᾳ δὲ αἰσθητὸν ἔσται ἄλλοις ὁμοίοις προσγενόμενον. ὅταν γὰρ ἀθροισθῇ ταῦτα ἃ κατ᾽ἰδίαν ὄντα καὶ κεχωρισμένα δυνάμει μόνον ἦν αἰσθητά, δι᾽ἀσθένειαν μὴ δυνάμενα τὴν αἴσθησιν κινεῖν ἐνεργείᾳ, καὶ γένηται ἐξ αὐτῶν τηλικοῦτον ὡς δύνασθαι κινεῖν ταύτην, † δι᾽ὧν ἡ κατ᾽ἐνέργειαν αἴσθησις γίνεται. οὐ γὰρ ἐν ποιότητι μόνῃ, ἀλλὰ καὶ ἐν ποσότητι τῆς δυνάμεως ἡ ὑπὸ τοῦ αἰσθητοῦ τότε κίνησις γίνεται ἐνεργείᾳ αἰσθητή, οὐχ ὡς ἑκάτερον αὐτῶν κατ᾽ἰδίαν ὂν αἰσθητόν, ἀλλ᾽ὡς διὰ τὴν σύνθεσιν συντελοῦντα τῷ ὅλῳ τῷ [τε] ἐξ αὐτῶν εἰς τὸ δύνασθαι κινεῖν τὴν κατ᾽ἐνέργειαν αἴσθησιν. οὕτω γὰρ καὶ ἐν τῷ ὅλῳ ὄντα δυνάμει αἰσθητά, οὐχ ὡς ἐνεργείᾳ δυνάμενά ποτε γίνεσθαι καθ᾽αὑτά, ἀλλ᾽ὡς μέρη. μέρη γὰρ ἦν τοῦ καθ᾽αὑτὸ αἰσθητοῦ, καὶ εἴη ἂν τῆς δυνάμεως αὐτῶν τῆς πρὸς τὴν αἴσθησιν, ἣν ἔχει κεχωρισμένα ἐνεργείᾳ, † ἡ ὑστέρα δύναμις, καθ᾽ἣν ἐν τῷ ὅλῳ ὄντα καὶ μέρη δυνάμει ἐλέγετο αἰσθητὰ εἶναι. τότε γὰρ αὐτῶν ἡ αἴσθησις ἀντιλαμβάνεταί πως καὶ ἐνεργεῖ περὶ αὐτά, εἰ καὶ μὴ ὡς καθ᾽αὑτὰ ὄντα κεχωρισμένα." ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium. Translatio moerbekana*, in THUROT, *Notices et extraits des manuscrits de la Bibliothèque nationale et autres bibliothèques, Vol. 25/2, op. cit.*, p. 250, l.10-p. 252, l. 5: "Quin ymo quoniam non secundum se sensibilis est separata, propter hoc et insensibilis et sine passione erit; sed erit secundum se existens potentia

This passage of Alexander's commentary, as I will show in the next chapter, exerted a fundamental influence on Medieval Latin commentators while reflecting on the third meaning of 'potentially perceptible', with extremely important consequences for their overall understanding of *minima sensibilia*.

It is also interesting to note that, in the last part of the passage quoted, Alexander also establishes a hierarchy (or at least a succession) between the two meanings of 'potentially perceptible' referring to the sensible qualities inhering in portions of matter so small that they could not be perceptible on their own. Indeed, Alexander affirms (although note that I am here following a textual emendation by Towey on Wendland's text) that the third one (i.e., that of being able to become actually perceptible once united with a sufficient quantity of matter endowed with the same sensible qualities) is "less important" (in Moerbeke's Latin, following a different *lectio* of the Greek, '*posterior*') than the first meaning of potentially perceptible I listed above (i.e., that of contributing to the actual perception of the whole to which they belong). This aspect shows, I believe, an

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sensibilis; habent quidem enim passiones sensibiles, propter parvitatem autem deficiunt ne possint movere sensum. Actu autem sensibile erit aliis similiter adveniens. Cum enim congregentur hec que singulariter existentia et separata potentia solum erant sensibilia, propter debilitatem non potentia sensum movere actu, et fit ex ipsis actu per que secundum actum sensus fit. Non enim in qualitate sola, sed et in quantitate virtutis que a sensibili motus fit actu sensibilis, non tamquam utrumque ipsorum singulariter ens sensibile, sed velut propter compositionem facientia toti quod ex ipsis ad posse movere secundum actum sensum. Sic enim, et in toto entia, potentia sensibilia, non ut actu potentia aliquando fieri secundum se, sed ut partes. Partes enim erant secundum se sensibilis, et erit utique virtutis ipsorum ad sensum, quam habent separata actu, posterior virtus, secundum quam in toto existentia et partes potentia dicebantur sensibilia esse. Tunc enim ipsa sensus percipit aliqualiter, et agit circa ipsa, et si non ut secundum se existentia separata." The same idea of the fact that the sensible qualities of such extremely small portions of matter become actually perceptible when united with a sufficient quantity of matter endowed with the same sensible qualities is restated by Alexander a few lines later: "ὅταν μὲν οὖν ταῦτα τὰ καθ᾽αὑτὰ διαλανθάνοντα τὴν αἴσθησιν ἐνυπάρχη τινὶ καὶ ἅμα τοσαῦτα ὡς ἤδη κινεῖν τὸ ἐξ αὐτῶν τὴν αἴσθησιν δύνασθαι καὶ μὴ μόνον ᾗ αἰσθητὰ τὰ ἐξ αὐτῶν δυνάμει, οὕτως ἔτι ἐν τῷ ὅλῳ ὄντα συντελεῖ τι τῷ ὅλῳ πρὸς τὴν ἐκείνου αἴσθησιν, ἀλλ᾽οὐ δυνάμει οὕτως ἐν τῷ ὅλῳ αἰσθητὰ ὡς, ἂν χωρισθῇ, δύνασθαι καὶ καθ᾽αὑτὰ αἰσθητὰ εἶναι" (ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium*, ed. WENDLAND, 120.22-121.4; ALEXANDER APHRODISIENSIS, *In librum De sensu commentarium. Translatio moerbekana*, in THUROT, *Notices et extraits des manuscrits de la Bibliothèque nationale et autres bibliothèques, Vol. 25/2*, *op. cit.*, p. 253, ll. 6-11: "Quando quidem igitur hec secundum se latentia sensum insint alicui et simul tot ut iam possint movere sensum que ex ipsis, et non solum sensibilia que ex ipsis potentia, sic adhuc in toto entia conferunt aliquid toti ad illorum sensum, sed non potentia sic in toto sensibilia ut, si separata fuerint, possint et secundum se sensibilia esse"; English translation, ALEXANDER OF APHRODISIAS, *On Aristotle on Sense Perception*, TOWEY (trans.), *op. cit.*, p. 112: "And so when these <bodies> that on their own escape detection of the sense 'are present' (446a17) in something and at the same time are 'so many' (446a17) that already that which <is put together> out of them is able to move the sense, and when those <bodies> which <are put together> out of them are not only potentially perceptible, so too when <the first bodies> are still in the whole they make some contribution to the whole with regard to the perception of it, but <they are> not potentially perceptible in the whole in such a way that they are able to be perceptible on their own if separated").

important effort on the part of Alexander to provide a comprehensive interpretation of Aristotle's doctrine of *minima sensibilia*.

Such attempt emerges also in his effort (121,5-122,2) to explain the reference Aristotle makes, at 445b27-29, to the distinction between the division of a continuous entity in equal and in unequal parts respectively by referring it to the two cases of the sensible qualities inhering in portions of matter that are separated from the whole to which they belong. In particular, Alexander claims that sensible qualities associated with portions of matter sufficiently great so as to be actually perceptible once separated from the whole to which they belong correspond to the (finite number of) equal parts in which a continuous entity can be divided. On the contrary, sensible qualities associated with portions of matter too small to be actually perceptible once separated from the whole to which they belong correspond to the (potentially infinite number of) unequal parts in which a continuous entity can be divided.

This distinction, in Alexander's text, serves the purpose of showing that only the sensible qualities which are potentially perceptible in the third meaning can be divided to infinity in accordance with the division of the continuous matter in which they inhere. The portions of the matter of a given material substance which, instead, are potentially perceptible in the second meaning, are limited in number and do not possess the property of (potential) infinite divisibility. The distinction provided by Alexander is extremely important in that it clearly implies that, whether or not one takes into account the corrupting action of the containing medium, the limit to the division *per accidens* sensible qualities is the same as that of the matter in which they inhere. No portion of matter whatsoever can exist in actuality without its sensible qualities. This aspect of Alexander's commentary, as I will show below, will exercise an extremely important influence on the Medieval Latin commentators more interested in his discussion on *minima sensibilia*.

The last section of Alexander's commentary on the issue of *minima sensibilia* (122,3-25) is concerned with a refutation of an argument, allegedly advanced by an early 4th-century BC atomist, Diodorus Cronus, in favour of the existence of indivisible magnitudes, an argument based on the limit between the smallest perceptible magnitude and the largest imperceptible one. While of great historical interest, this discussion is substantially distinct from (although, of course, connected to) the issue of *minima sensibilia*, and, what is more, it will not be taken up by Medieval Latin commentators (at

least not in the context of the discussion of *minima sensibilia*), therefore I disregard it here, also because it has already been analysed by Richard Sorabji in some englithening pages of one of his most important studies[686].

3.4. *Minima sensibilia* in the Islamic World: An Indirect Influence on the Medieval Latin Debate

As I mentioned in the previous chapter, although the *De sensu* was translated into Arabic in all likelihood already in the 9th century AD (together with other five treatises from the traditional list of the *Parva naturalia*)[687], the only commentary on the *De sensu* originating in the Islamic world to have reached the Latin West of the 13th and the 14th century is Averroes' *Epitome* on the *Parva naturalia* (the ones available in Arabic, namely the *De sensu*, the *De memoria*, the *De somno et vigilia*[688], and the *De longitudine et brevitate vitae*). This work has been completed by Averroes in January 1170 and has been critically edited both in its Latin translation(s)[689] and in the Hebrew one[690].

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[686] SORABJI, *Time, Creation and the Continuum: Theories in Antiquity and in the Early Middle Ages*, *op. cit.*, pp. 345-347, which connects the reference to Diodorus Cronus' atomistic argument here with the one made by Alexander at 172.28-173.1 in Wendland's edition.

[687] The critical edition of the Arabic translation of the first six treatises of the *Parva naturalia*, the *Kitāb al-Ḥiss wa-l-maḥsūs*, dating back to the time of al-Kīndī (and which had long believed to be lost), is in preparation by Rotraud Hansberger. This work is probably closer to a paraphrase than to a translation of the corresponding Aristotelian texts, where also Neoplatonic and Galenic elements play an important role (cf., for a presentation of these issues, R. HANSBERGER, Kitāb al-Ḥiss wa-l-maḥsūs. *Aristotle's* Parva naturalia *in Arabic Guise*, in GRELLARD, MOREL (eds.), *Les* Parva naturalia *d'Aristote, Fortune antique et médiévale*, *op. cit.*, pp. 143-162).

[688] Including under this title also the *De somniis* and the *De divinatione per somnum*, together with the *De somno et vigilia* proper, as it will later happen in the Medieval Latin world of the 13th and the 14th century.

[689] AVERROES CORDUBENSIS, *Compendia librorum Aristotelis qui Parva Naturalia vocantur (Corpus commentariorum Averrois in Aristotelem, Versionum latinarum, Vol. VII)*, ed. A.L. SHIELDS, H. BLUMBERG, Cambridge, MA, The Mediaeval Academy of America, 1949. There are two extant versions of the Latin translation of Averroes' *Epitome*. One of them, which is called the *Vulgata* by the editors, is the one which is preserved in the large majority of manuscript witnesses and, although it is attributed to Gerard (of Cremona, very likely) in ms. Paris, BnF, Lat. 14385, f. 44v, it can be safely ascribed to Michael Scot. The other one, which the editors called the *Parisina*, is only preserved in ms. Paris, BnF, Lat. 16222, ff. 40r-45r. For what concerns the commentary to the *De sensu* (and also that of the *De memoria*), the two versions are largely in agreement, although they differ much more markedly concerning the commentary of the *De somno* and of the *De causis longitudinis et brevitatis vite*. For some additional considerations on the structure of Averroes' *Epitome* in relation with the Aristotelian text (although they have been written before the discovery of the Arabic text of the Parva naturalia) see A. ALTMANN, "Gersonides' Commentary on Averroes' Epitome of *Parva naturalia*, II.3. Annotated Critical Edition", *Proceedings of the American Academy for Jewish Research* 46/47, 1979-1980, pp. 1-31.

[690] AVERROES CORDUBENSIS, *Compendia librorum Aristotelis qui Parva Naturalia vocantur (Corpus commentariorum Averrois in Aristotelem, Versionum hebraicarum, Vol. VII)*, ed. H. BLUMBERG,

Nevertheless, consistently with the features of Averroes' *Epitomes*, even the one on the *De sensu* (and on the *Parva naturalia* in general) shows a significant degree of independence from the Aristotelian text. As Matteo Di Giovanni recently put it, making explicit reference to Dimitri Gutas[691], "Averroes's *Epitomes* (*ǧawāmiʿ*) are in fact 'abstract of demonstrable truths' of philosophy with no visible link to the text commented on[692]". In the case of the *Epitome* on the *De sensu*, the only link to the text is constituted by the fact that Averroes chooses the arguments he is most interested in among those discussed by Aristotle in the text commented upon, and he develops them according to his own needs and overall theoretical and cultural framework.

As a result, when dealing with the three *aporiai* contained in the last three chapters of the *De sensu*, Averroes does insert a section dealing with all the senses and their proper sensibles, but, instead of focusing on the topics considered by Aristotle, he replaces them with a thorough summary of the process by which the forms of sensible qualities are received by the external senses and then transmitted to the internal ones[693]. Averroes' summary includes important considerations both on the ontology of the species of sensible qualities in the medium and in the sense organs, and on the physiology of the sense organs themselves. A special focus, in this respect, is brought by Averroes on sight and on the internal anatomy of the eyes. To all this, Averroes also adds some remarks concerning the distinction between the apprehension of sensible and intelligible forms through the process of cognition.

Throughout Averroes' discussion, however, none of the three *aporiai* discussed by Aristotle in the last two chapters of the *De sensu* is dealt with (although there is a brief mention of the second one of them, namely, the issue of whether perception, for the

Cambridge, MA, The Mediaeval Academy of America, 1958. The Hebrew translation of Averroes' *Epitome* was completed by Moshe ibn Tibbon in the summer of 1254.

691 D. GUTAS, *Aspects of Literary Form and Genre in Arabic Logical Works*, in C. BURNETT (ed.), *Glosses and Commentaries on Aristotelian Logical Texts: The Syriac, Arabic, and Medieval LatinTraditions (Warburg Institute Surveys and Texts 23)*, London, Warburg Institute, University of London, 1993, pp. 29-76.

692 M. DI GIOVANNI, *The Commentator: Averroes' Reading of the* Metaphysics, in G. GALLUZZO; F. AMERINI (eds.), *A Companion to the Latin Medieval Commentaries on Aristotle's* Metaphysics *(Brill's Companions to the Christian Tradition 43)*, Leiden, Brill, 2013, pp. 59-94, here p. 61.

693 Cf. AVERROES CORDUBENSIS, *Compendia librorum Aristotelis qui Parva Naturalia vocantur (Corpus commentariorum Averrois in Aristotelem, Versionum latinarum, Vol. VII)*, ed. SHIELDS, BLUMBERG, pp. 25-44.

distance senses, is an instaneous or a successive process[694]). No reference, in particular, is made by Averroes to the issue of *minima sensibilia*.

This does not mean, however, that Averroes did not play any role in the Medieval debate on *minima sensibilia*, especially in the Latin world. Quite the contrary. Indeed, Averroes' doctrine of *minima naturalia*, as presented in the previous chapter, can (and, in principle, should) be extended also to *minima sensibilia*, and this on two levels. First of all, Averroes' commitment to *minima secundum formam*, i.e., to the idea that substantial forms determine the minimal and maximal quantity of matter with which they can be united has the direct consequence that, in quantities of matter smaller than the *minimum naturale* of a given substantial form, also the sensible qualities inhering in it are lost together with the substantial form itself. Secondly, it is a logical consequence of Averroes' doctrine of *minima secundum formam* that also the accidental forms of sensible qualities, by analogy with substantial forms, determine the minimal and maximal quantity of matter with which they can be united (supposedly the same as the one determined by substantial forms). That is to say, Averroes' doctrine of *minima* (*naturalia*) *secundum formam* could easily be interpreted as entailing a corresponding doctrine of *minima sensibilia secundum formam*.

The fact that no remark in this direction can be found in the text of Averroes' *Epitome* is unfortunate. Nevertheless, as I will show below, Averroes' doctrine of *minima naturalia* has been extended also to *minima sensibilia* (along the two lines just mentioned) in the Medieval Latin world. Indeed, an explicit adherence to a doctrine of *minima sensibilia secundum formam*, evidently developed by analogy with the corresponding doctrine of *minima (naturalia) secundum formam* is clearly present in Aquinas' commentary on the *De sensu*, and, through his influence, also in the one by Peter of Auvergne (although with some important modifications). In this sense it is certainly possible to say that, even though Averroes did not exert a *direct* influence on the Medieval Latin debate on *minima sensibilia*, he certainly exerted an important *indirect* one.

Moreover, as I will show especially in the next chapter, there is another work by Averroes that exerted a fundamental influence on the Medieval Latin debate on *minima sensibilia*, specifically in the early 14th century, namely, Averroes' *Long Commentary* on

694 Cf. AVERROES CORDUBENSIS, *Compendia librorum Aristotelis qui Parva Naturalia vocantur (Corpus commentariorum Averrois in Aristotelem, Versionum latinarum, Vol. VII)*, ed. SHIELDS, BLUMBERG, p. 34.

the *Metaphysics*. John of Jandun will be the main commentator responsible for this conceptual development. Indeed, his entire discussion of the issue of *minima sensibilia*, as I will show in the next chapter, is founded upon a reflection on the connection between the essence of sensible qualities as accidental forms and their power to perform their proper operation (i.e., that of acting on the external senses so as to engender a sensation). Jandun takes very seriously the belief, explicitly drawn from Averroes' *Long Commentary* on the *Metaphysics*, that an entity that does not possess the power to perform its proper operation automatically loses its essence (a belief that is supplemented by other commentators with the corresponding one that the performance of its proper operation is what makes a form known; a belief, once again, drawn from Averroes' *Long Commentary* on the *Metaphysics*). Interestingly, Jandun's solution to the issue of *minima sensibilia* (such as that of a set of almost contemporary commentators) passes through a reelaboration along partially different lines of this more general principle. Thus, while all the details of this discussion will be analysed especially in the next chapter, it is important to notice since the outset of this study of the Medieval Latin debate on *minima sensibilia* that Averroes' influence on it was absolutely remarkable, although Averroes did not develop a specific position concerning *minima sensibilia* themselves.

3.5. The Early Medieval Latin Debate on *Minima sensibilia* in the Oxford Tradition

3.5.1. Adam of Buckfield and His Circle: The Origin of the Dichotomy *Virtute*/*Actione* and the Issue of the *Distantia* between Sensible Qualities and their Corresponding External Senses

The first extant Medieval Latin commentaries on the *De sensu* which can be be attributed to a known master (without considering the glosses to the text of the *translatio vetus*) are those by Adam of Buckfield.

As I have reported in my inventory at the end of the thesis, there are three extant versions of Buckfield's commentary[695]. The relation between the three versions is

[695] The manuscripts preserving the three versions of Buckfield's commentary are the following ones:
a. *In De sensu et sensato (Recensio I):*
MSS:

summarised by Griet Galle, the main scholar who has worked on the texts, as follows. The first *recensio* (of which exists also an *abbreviatio*) "is a detailed analysis of Aristotle's text, with a number of digressions and *dubitationes*[696]". In contrast to it, the second *recensio* "gives an analysis of the text that is much shorter than the analysis in *recensio 1*. His [i.e., of the author] exposition reconstructs the conceptual content of the text and does not discuss the details of the *littera* of the text[697]". Finally, the third *recensio*

- Madrid, Biblioteca Nacional, 3314 (mid-13th century), ff. 100r-110r (anonymous).
- Milano, Biblioteca Ambrosiana, H.105.Inf. (13th-14th century), ff. 1r-18r (anonymous, incomplete at beginning).
- Oxford, Balliol College, 313 (late 13th century), ff. 132r-144v.
- Philadelphia, Free Library, Lewis European 53 (ca. AD 1250-AD 1280), ff. 52r-57v (anonymous).

b. *Abbreviationes* of *Recensio I:*
MSS:

- Cambridge, Gonville & Caius College, 384 (506) (13th century, England), ff. 282r-293v. (anonymous, *translatio vetus* with long passages of comment in all the lower margins, with lemmata).
- Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 4° 312 (likely 13th century, England, for a part of the manuscript including the *De sensu* commentary), ff. 69v-73v (anonymous).

c. *In De sensu et sensato (Recensio II):*
MSS:

- Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 5988 (second half of the 13th century), ff. 34r-41v (anonymous).
- Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° F.318 (late 13th-early 14th century), ff. 150ra-161ra (anonymous).
- London, Wellcome Historical Medical Library, 3 (AD 1300), ff. 53v-60r (anonymous).

d. *In De sensu et sensato (Recensio III):*
MSS:

- Lisboa, Biblioteca Nacional, Alcobaça 179 (*olim* Coimbra 382) (mid-13th century), ff. 126v-141r.

The textual history of Buckfield's commentaries has been thoroughly investigated by Griet Galle in two important contributions: G. GALLE, "Edition and Discussion of the Oxford Gloss on *De Sensu* 1", *Archives d'histoire doctrinale et littéraire du Moyen Âge* 75, 2008, pp. 197-281, and EAD., *Interpretations of the* Translatio Vetus *of* De sensu *I in Commentaries Attributed to Adam of Buckfield and in the Oxford Gloss*, in P. BERNARDINI (ed.), *I manoscritti e la filosofia. Atti della Giornata internazionale di Studi, Siena, 18 aprile 2007*, Siena, Edizioni dell'Università di Siena, 2010, pp. 47-66, to which one should also add EAD., "A Comparison of Three Commentaries on *De Sensu* 1 Attributed to Adam of Buckfield", *Micrologus* XXXI bis, forthcoming. The *recensio II* of Buckfield's commentary on *De sensu* 7 has been edited in J. TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *Cahiers de l'Institut du Moyen-Âge grec et latin* 90, 2021, pp. 112-225, pp. 150-173.

[696] G. GALLE, "Edition and Discussion of the Oxford Gloss on *De Sensu* 1", *op. cit.*, p. 205.

[697] G. GALLE, "Edition and Discussion of the Oxford Gloss on *De Sensu* 1", *op. cit.*, p. 207.

"offers [like the first one] a detailed analysis and interpretation of *De sensu*, but it also contains *questiones* (about the problems discussed in digressions in *recensio 1)*[698]".

It is also not entirely clear whether all the three versions of the commentary can be ascribed to Buckfield himself, or to one or more of his students[699]. Nevertheless, contrary to what is generally true concerning the three commentaries (i.e., that there are important theoretical differences between them), concerning *minima sensibilia* the three commentaries seem to be in fundamental agreement, accepting the gist of Aristotle's solution and largely using the same concepts and vocabulary to explain it. As a result, I will refer to all of the commentaries as bearing the sign of Buckfield's position on the issue.

One aspect must be remarked from the outset of the discussion, however. Since the commentaries (like Buckfield's *Physics* commentaries referred to in Chapter 2) are mostly dedicated to elucidating the text of *De sensu* 6, 445b3-446a20, and given that they still share many features (both stylistically and from the point of view of contents) with the tradition of early Oxford interlinear and marginal glosses to the *De sensu*[700] (a

[698] G. GALLE, "Edition and Discussion of the Oxford Gloss on *De Sensu* 1", *op. cit*., p. 207.

[699] As Galle summarises the issue in her most recent contribution on Buckfield's *De sensu* commentaries (using the same numbering as I do): "The question concerning the authenticity of the commentaries on *De sensu* associated with Bockenfield has not yet been answered in a definite way. In my previous studies, I argued that comm1 is authentic, because the text is attributed to "magister A. de Bocfelde" in one manuscript and has the methodological and stylistic characteristics of Bockenfield's commentaries. Assuming that comm1 is authentic, I considered the authorship of comm2, which is transmitted anonymously, to be doubtful, as it uses another manuscript of the *translatio vetus*, differs from comm1 in structure, language and content (i.e., in the interpretation of Aristotle's text), and frequently offers a better interpretation. Yet Donati notes that there are stylistic similarities between comm2 and *recensio 2* of the commentary on *De memoria*, which according to Brumberg-Chaumont and Poirel (which call it the commentary "In precedenti libro") is written by Bockenfield. Mansfeld reports that the ideas and commenting style of comm2 is close to the commentary on *De sensu* by Adam of Whitby, who might be a younger colleague of Bockenfield in Oxford. These remarks imply that one should again take into consideration that Bockenfield might be the author of comm2. Concerning comm3, I argued that, on the one hand, the similarities between comm1 and comm3 and the two attributions to "Adam anglicus" by a later hand make Bockenfield's authorship probable; but that, on the other hand, the fact that comm3 occasionally combines the interpretations of comm1 and comm2 could point to the activity of another author who composed a commentary on the basis of comm1 and another commentary, which contained ideas that are present in comm2. Mansfeld shows that in the discussion of the middle colour, comm3 expresses ideas that are absent in other early commentaries on *De sensu*. I concluded that it is unlikely that Bockenfield is the author of the three commentaries, but I did not entirely exclude the possibility. I argued that, if one defends the thesis that Bockenfield is the author of the three commentaries, one has to assume an evolution in his interpretation of *De sensu* and in his use of standard expressions for commenting, and one could establish a relative chronology: comm1 – comm2 – comm3" (GALLE, "A Comparison of Three Commentaries on *De Sensu* 1 Attributed to Adam of Buckfield", *op. cit.*).

[700] On this aspect, cf. S. DONATI, "Il commento alla *Fisica* di Adamo di Bocfeld e un commento anonimo della sua scuola: Parte I", *Documenti e studi sulla tradizione filosofica medievale* IX, 1998, pp. 111-178, and EAD., "Il commento alla *Fisica* di Adamo di Bocfeld e un commento anonimo della sua scuola: Parte II", *Documenti e studi sulla tradizione filosofica medieva*le X, 1999, pp. 233-297, and BRUMBERG-

tradition that I do not have the possibility to analyse in the presen thesis, as said), I will limit my discussion of Buckfield's commentaries to underlining some of the aspects (notably two) that can be related to subsequent discussions of *minima sensibilia* (which, it should be noted, is largely independent from any reference to the issue of *minima naturalia*, an issue, as shown in the previous chapter, that does not significantly attract Buckfield's attention when commenting upon *Physics* I.4).

First of all, an aspect which is already evident in the commentaries associated with Buckfield, and that will exercise a constant influence over the subsequent Oxford commentary tradition on the issue of *minima sensibilia*, is the fact that the Aristotelian notions of 'potentially perceptible' and 'perceptible in act' are largely equated with, or even sometimes entirely replaced by, the notions of perceptible *virtute* and *actione*. This change had, of course, a basis in the text of the *translatio vetus* of the *De sensu*, as I have already remarked multiple times, since such translation consistently uses *virtute* instead of *potentia* and *actione* instead of *actu*. Still, as I have also said, it is already evident from the early glosses on the *De sensu* (and it will be confirmed throughout all the subsequent commentary tradition) that the readers of the *translatio vetus* perfectly understood the correspondence, in the text, between *potentia* and *virtute* and between *actu* and *actione*. Nevertheless, since Buckfield's commentaries, Oxford commentators on the *De sensu* frequently tried to go "beyond" Aristotle's text so as to devise a specific notion of sensible *virtute* and of sensible *actione* that do not exactly correspond to the Aristotelian ones, although in Buckfield this attempt is still only briefly sketched and articulated in a somewhat ambiguous way. Nevertheless, by looking at Buckfield's commentaries, we can get a sense of the fact that the process which would become evident in the late 13th-century Oxford *De sensu* commentary tradition, as I will show below, had already started long before that time, albeit in a tentative way. Indeed, Buckfield characterises the two notions of sensible *virtute* and of sensible *actione* in the following way:

> Consequently, [Aristotle] replies to the arguments to the contrary through a distinction, saying that a sensible is in two ways. One is the sensible *virtute*, i.e., that by itself is sensible both when the passion is perceived in act (*actualiter*) and when

CHAUMONT, POIREL, *Adam of Bockenfield and his Circle on Aristotle's* De memoria et reminiscentia, *op. cit.*

> it is not; the second is the sensible *actione*, i.e., that is in such quantity that it can modify the sense by itself[701].

Buckfield's reasoning seems to be that a sensible quality is always sensible *virtute*, insofar as it not only has the nature of a sensible, but it is also always "active" towards the senses, although its action is not always able to engender a sensation (whereas, in Aristotle's text, as seen, the first two meanings of potentially perceptible, that is, the only ones that apply to the actual world, always entail that what is potentially perceptible is also perceived in act, at least as part of a larger whole). On the contrary, a sensible *virtute* becomes also sensible *actione* when its action is strong enough to modify the sense so as to engender a sensation. On this understanding, far from being the two terms of a disjunction, the two concepts are to be understood as being in a clear relation: being sensible *virtute* is a necessary condition (but not a sufficient one) to also become sensible *actione*.

In Buckfield's *De sensu* commentaries, it is true, this view is still not clearly articulated, and the two notions of sensible *virtute* and sensible *actione*, as a result, are sometimes not clearly distinguishable from Aristotle's corresponding ones[702]. Still, when Buckfield considers the notion of sensible *virtute* in isolation, that is, on its own, without taking into account the corrupting action of the containing medium, one can already distinguish, *in nuce*, this view:

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[701] ADAM DE BUCKFIELD, *In De sensu et sensato (recensio II)*, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 5988, f. 39ra: "Consequenter, respondit ad rationes ad oppositum per distinctionem dicens quod sensibile est duobus modis. Est unum sensibile virtute, scilicet quod de se est sensibile cum passio sentitur (*ms.* sentiri) actualiter <et> cum non; secundum (*ms.* secundo) sensibile actione (*ms.* actionis), quod, scilicet, est in tali quantitate quod potest immutare sensum per se." *Recensio II* of Buckfield's commentary is quoted according to the Vatican manuscript, which has, however, been fully collationated with the text of ms. London, Wellcome Historical Medical Library, 3.

[702] This is especially evident when Buckfield glosses Aristotle's doctrine of *minima sensibilia* by saying that "sensibile autem passio est divisibile in infinitum in sensibilia secundum virtutem, non tamen in infinitum in sensibilia secundum actionem" (ADAM DE BUCKFIELD, *In De sensu et sensato (recensio II)*, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 5988, f. 39ra). Note that a somewhat more "Aristotelian" understanding of the two notions of sensible *virtute* and sensible *actione* seems to prevail in *recensio I* of Buckfield's commentary (cf., for instance, ADAM DE BUCKFIELD, *In De sensu et sensato (recensio I)*, quoted according to ms. Milano, Biblioteca Ambrosiana, H.105.Inf, f. 13vb: "Nam intencio sue solucionis <est> quod passio sensibilis dupliciter est aut scilicet virtute aut actione, passio autem sensibilis divisibilis est in infinitum virtute per divisionem subiecti. Nam non est aliqua pars ita parva passionis sensibilis que virtute et natura sua non sit sensibilis. Actione autem non est passio sensibilis divisibilis in infinitum. Est nam quantitas determinata in qua potest passio sensibilis agere et movere sensum ita quod non in minori. [...] supponendum est hoc, quod aliud est esse actum et esse potencia sive virtute. Et similiter aliud est esse sensiblie actu et sensibile virtute. Et suppono hic quod in libro (*sic!*) *De anima* est ex intencione determinatum, nam dicit (sc. Aristoteles) <quod> omne sensibile <potest> dici dupliciter, actu scilicet et potencia sive virtute").

> Therefore, the ten-thousandth part of a millet seed will not be seen in actuality (*actualiter*), […] and really the *diesis*, which is the sound of two points [immediately next to each other], is not heard by itself due to [its] smallness, even though the whole sound of which it is a part is heard. Nevertheless, the distance of the same sensible with respect to the sense makes this insensibility, even though this distance is understood not according to place, but according to nature (*non secundum locum sed secundum naturam*). Indeed, the sense <is> simple by itself, and it does not lack parts, […] but any part of the sensible acts on the whole sense, since the sense is simple, and this is the reason why the sense is not modified by its [corresponding] sensible in any magnitude whatsoever but [only] in a determinate [one] […].[703]

Buckfield's position in the passage seems to foreshadow the understanding of sensibles *virtute* as entities that are always "active", without, however, being able to achieve their action due to their smallness[704].

In order to explain the inability of the senses in this respect, moreover, Buckfield refers to a concept, that of the distance (*distantia*) between a sensible quality and its corresponding sense, which plays a fundamental role in his overall understanding of *minima sensibilia*, and that represents, as well, the second aspect of major interest of his commentaries for the present chapter. Indeed, Buckfield, following what is, as seen, a concept clearly present in the Aristotelian text of *De sensu* 6, remarks that, contrary to sensible qualities, sensory powers cannot be divided, not even *per accidens*, according to the division of the sensory organ itself. Buckfield, in this sense, seems to believe in the idea that the sensitive soul, just like the rational one, is a simple, and therefore indivisible, entity, or that, at the very least, each sensory power is such. This fundamental ontological difference between sensible qualities and sensory powers creates a distance between them that, as said in the passage just quoted, has nothing to do with the relative spatial proximity or distance between them, but only concerns their nature. The consequence of this difference becomes evident when a sensible quality is divided *per accidens* in smaller and smaller portions of matter separated from the sensible whole to which they belong.

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[703] ADAM DE BUCKFIELD, *In De sensu et sensato (recensio II)*, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 5988, f. 39ra-b: "Ideo decima millesima pars milii actualiter non videtur, [...] et realiter diesis qui est sonus punctorum duorum non auditur propter parvitatem per se licet totus sonus cuius est pars audiatur. Hanc autem insensibilitatem facit distan[c]tia ipsius sensibile ad sensum, licet (?) intelligatur ista distantia non secundum locum sed secundum naturam. Sensus nam simplex <est> de se (*ms*. sui), nec carens partibus, [...] |f. 39rb| sed quelibet pars sensibilis (*ms.* sensibile) agit in totum sensum cum sit sensus simplex, et hoc est causa quare sensus non immutatur a suo sensibili in quacumque magnitudine sed in determinata [...]."

[704] In this sense, it is also interesting to note that, although only in the case of a possible world without the corrupting action of the containing medium, Buckfield already denies the coextension of the sensible world and of the perceptible one.

Indeed, given that the power of sensible qualities associated with increasingly smaller portions of matter is proportionally inferior, below a certain threshold of smallness the sensible qualities concerned are not strong enough to cause a sensation in the sensory power upon which, when they were stronger, they were able to exert an action.

This conception interestingly prefigures one of the debates that would become common in late-13th- and early-14th-century *De sensu* commentaries, as I will show in the next chapter, namely, a debate concerning the fact that, given that a sensible quality is an active power whose corresponding sense is the corresponding passive power, since it is not possible that an active power exists without its corresponding passive power, it will therefore be impossible for a sensible quality to exist without a corresponding sense (or sensory power) capable of perceiving it. The answers that will be given by later commentators would tend to focus on the fact that this principle of natural philosophy only works when both the active and the passive power exist in a sufficient quantity of matter. Instead, Buckfield's solution is interesting and original: his claim seems to be that this principle of natural philosophy only holds when there is no ontological distance between the active and the passive powers involved, that is, when there is no ontological dissimilarity between them such as, in this case, the fact that one of them is a simple, partless entity, while the other is not. In such cases, the correspondence between the two powers only holds for the parts of the power endowed with parts that are commensurate (or, maybe better, proportional) to the partless power. As Buckfield summarises it: "In an action or passion, instead, […] the agent has parts proportional to the parts of the patient upon which [its parts] should act […][705]". This is also why, in the third version of his commentary, Buckfield defines the distance between the sensible quality and its corresponding sense as "the perfect proportion of the sensible with respect to the sense[706]".

All in all, it might be said that Buckfield's discussion of *minima sensibilia*, while still mainly concerned with the clarification of Aristotle's text (which he shows to grasp in all its nuances), already contains some of the most important lines of development that

[705] ADAM DE BUCKFIELD, *In De sensu et sensato (recensio II)*, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 5988, f. 39rb: "In una autem actione vel passione [...] habet agens partes proportionales partibus patientis in quas agant [...]."

[706] ADAM DE BUCKFIELD, *In De sensu et sensato (recensio III)*, ms. Lisboa, Biblioteca Nacional, Alcobaça 179, f. 137va: "[...] intendes quod distantiam que est perfectam proportionem (*ms.* proportionis) sensibilis ad sensum [...]."

will affect the subsequent debate on *minima sensibilia*, especially in the Oxford commentary tradition.

3.5.2. Roger Bacon: The Full Development of the Doctrine of *Minima secundum sensum*

A somewhat richer discussion is the one that can be found in the *De sensu* commentary by Roger Bacon (1214/1220-1292), one of the first Masters of Arts at Paris in the 1240s, among the first to teach Aristotle's *libri naturales* (and *Metaphysics*) there, before becoming an "independent scholar" working on topics so disparate as language, optics, ethics and many others. Roger Bacon's commentary on the *De sensu* (a loose paraphrasis of the Aristotelian text, structured in chapters and including objections and digressions) has been preserved in a single manuscript witness, ms. British Museum, Add. 8786, ff. 62r-84r. The paternity of the text, probably dating to the early 1250s and edited by Robert Steele in the *Opera hactenus inedita Rogeri Baconi*[707], has generally been accepted, and (at least for what concerns the issue of *minima sensibilia*) the text is in absolute agreement with Bacon's position as stated in the *Quaestiones supra libros octo Physicorum Aristotelis*, and in opposition to the position adopted in the *Quaestiones supra libros quatuor Physicorum Aristotelis*. This observation, be it said incidentally, also provides important doctrinal support to the claim that only the *Supra libros octo*, and not the *Supra libros quatuor*, can be considered an authentic Baconian commentary on the *Physics*.

The fact that Bacon's commentary seems to originate from a period in which he was not anymore master of arts in Paris (ca. 1240-1249) can also be supported by the observation that, contrary to the *Supra libros octo* and to the other commentaries preserved in the ms. Amiens 412 (and safely datable to the 1240s), Bacon's *Liber de sensu et sensato* not only is not preserved in the same manuscript, but, what is more, it is not even a question commentary. Moreover, in the *Liber de sensu* (and, as it will be shown below, also in the commentary on *De sensu* 6) Bacon makes an important use of sources which do not feature in his *Parisian* commentaries, such as, prominently, Alhazen's *De*

[707] Cf. ROGERUS BACON, *Liber de sensu et sensato. Summa de sophismatibus et distinctionibus (Opera hactenus inedita Rogeri Baconi Fasc. XIV)*, ed. R. STEELE, Oxford, Clarendon Press, 1937.

aspectibus. All these observations seem to suggest that the *Liber de sensu* has been composed by Bacon after the end of his tenure as a Parisian *magister artium*. Conversely, the fact that the commentary cannot be dated to the late 1250s or even later is rather clear by looking at the fact that, in the *Liber de sensu*, many of Bacon's main natural philosophical doctrines still appear *in fieri*. This is, especially, the case for what concerns the question of the *esse* of *species* in the medium and in the sense organs. Indeed, in the *De multiplicatione specierum*, a surely Baconian work whose composition can be dated quite safely between the end of the 1250s and the beginning of the 1260s, Bacon resolutely affirms the materiality of the *esse* of *species* in the medium and in the sense organs, violently attacking those commentators who take the opposite view. This position will remain the one adopted by Bacon in all his later works, from the *Communia naturalium* to the *Opus majus*, *minus* and *tertium*. Nevertheless, in the *Liber de sensu*, when Bacon considers the same issue, he takes a more nuanced view, attributing to *species* in the medium and in the sense organs an *esse* which he labels as *esse similitudinale*, and which he defines as a composition between *esse materiale* and *esse formale*. This example alone, together with many others which could be adduced, clearly points to an author who is still in the process of developing the mature system of thought that he will later adopt with great conviction[708].

Bacon's commentary on the issue of *minima sensibilia* is contained in chapter 22 of the *Liber*. The first thing to remark concerning Bacon's discussion is the fact that, while he accepts the general lines of Aristotle's solution to the issue, he conducts his overall discussion without making reference to the conceptual couple of being potentially perceptible and being actually perceptible, and even without making recourse to the conceptual couple of being sensible virtute and being sensible actione. This sets him apart, on this aspect, from the entire known Medieval Latin *De sensu* commentary

[708] Concerning the dating of the *Liber de sensu*, see especially L. LIČKA, *The Visual Process: Immediate or Successive? Approaches to the Extramission Postulate in 13th Century Theories of Vision*, in E. BAĽTUŢĂ (ed.), *Medieval Perceptual Puzzles: Theories of Perception in the 13th and 14th Centuries*, Brill, Leiden 2020, pp. 73-110, p. 88, who, contrary to S.C. EASTON, *Roger Bacon and His Search for a Universal Science: A Reconsideration of the Life and Work of Roger Bacon in the Light of his own Stated Purposes*, New York, NY, Columbia University Press, 1952, pp. 59-61 and pp. 232-235 (who favours a dating of the commentary in the 1240s), supports a dating of the *Liber de sensu* in the early 1250s, thus later than Bacon's other Aristotelian commentaries, mostly based on his knowledge (evident in the *Liber de sensu*, but not in his previous Aristotelian commentaries) of Alhazen's *De aspectibus*, as said above. Concerning the issue of the *esse* of *species* in the medium and in the sense organs in the *Liber de sensu*, see R. ZAMBIASI, "The *Esse Similitudinale* of *Species* in Roger Bacon's *Liber de sensu et sensato*", forthcoming.

tradition. Moreover, Bacon, differently from Buckfield, clearly considers the issue of *minima naturalia* preliminary to that of *minima sensibilia*. Indeed, he notes that in the case of animate (heterogeneous) material substances (living beings) the division *per accidens* of the substantial form (the soul) stops at a quantity of matter which is sufficient to allow the substantial form to animate the body under consideration; in the case, instead, of inanimate (homogeneous) ones (as Bacon demonstrated in the *Supra libros octo*) there are no intrinsic *minima naturalia*:

> […] the [substantial] form because of its nobility is more separated (*elongatur*) from the conditions of matter, so that it does not fulfill the whole and the parts in the same sense, [and] there the division of the form does not take place according to the division of prime matter, but according to the division of the continuum; but it requires a sufficient [quantity of] matter (*debitam materiam*), and therefore in animals and plants it is not inconvenient that the division stops in the parts that are not animate, then because such as in inanimate entities any part is inanimate in its whole, so any animal part [is] animate in its body, but separated from the whole the soul of the whole neither remains animate, nor [is] the soul that it had before […][709].

Bacon's reasoning in distinguishing between animate (heterogeneous) substances and inanimate (homogeneous) ones, as it was in the *Supra libros octo* relies on the very notion of a homogeneous body as an entity whose parts, whatever their size, have the same nature as the whole to which they belong (and of a heterogeneous body, conversely, as an entity whose parts, below a certain threshold, do not have the same nature as the whole to which they belong).

The denial of the existence of intrinsic *minima naturalia* for inanimate (homogeneous) substances has an immediate consequence also for the issue of *minima sensibilia*. Indeed, as Bacon noted in a previous passage, since "a subject cannot be without its proper passion[710]", such as fire without its heat (to use the example most frequently quoted by Bacon in the chapter), if there are no intrinsic *minima naturalia* in inanimate (homogeneous) substances, there cannot be "intrinsic" *minima sensibilia* for

[709] ROGERUS BACON, *Liber de sensu et sensato*, cap. 22, ed. STEELE, p. 112, ll. 6-16: "[...] forma propter sui nobilitatem elongatur magis a condictionibus materie, ita quod non perficiat totum et partes secundum eamdem rationem, ibi non cadit divisio forme secundum divisionem materie prime, set secundum divisionem continui; set exigit debitam materiam, et ideo in animalibus et planttis non est inconveniens quod stet divisio ad partes que non sunt animalia, tum quia sicut in inanimatis quelibet pars est inanimata in toto suo, ita quelibet pars animalis animata in corpore suo, set separata a toto non manet animata anima totius nec anima quam prius habuit [...]."

[710] ROGERUS BACON, *Liber de sensu et sensato*, cap. 22, ed. STEELE, p. 111, ll. 30-31: "subjectum non potest esse sine propria passione."

the same substances. That is to say, insofar as sensible qualities are accidental forms which inhere in a given material substance with a specific substantial form, the persistence of the substantial form determines the persistence of the accidental forms inhering in the given material substance.

Nevertheless, Bacon is clearly unsatisfied with a line of reasoning merely based on this argument. Therefore, he goes on to extend his reasoning concerning the univocity between a homogeneous whole and its parts from the case of substantial forms to that of sensible qualities, providing, in this way, an independent argument against the existence of "intrinsic" *minima sensibilia* in inanimate (homogeneous) substances founded upon the univocity between the sensible qualities of a homogeneous whole and those of its proper parts:

> […] then, [it is proved that it is not possible to reach, by division, a part of a sensible substance which has lost its sensible nature] because the same is the nature of a homogeneous whole and of its parts, any part indeed of fire is fire, and any sensible part will be sensible; then, because a body is divided in parts any of which is quantitative, therefore by similitude a sensible body is divided in parts any of which is sensible; then, because for the same reason for which a part is sensible also the other [is sensible], therefore either any [part is sensible] or none [is] […][711].

This second argument, significantly, creates a strong parallel between Bacon's solution to the existence of *minima sensibilia* in inanimate homogeneous substances and his solution to the existence of *minima naturalia* in these same substances as put forth in his *Physics* commentary.

The fact, indeed, that Bacon clearly had in mind the text of *Physics* I.4 while discussing the issue of *minima sensibilia* is evidenced by the fact that he mentions it explicitly in his discussion on *De sensu* 6, while presenting the first of three objections to his position according to which there are no "intrinsic" *minima sensibilia* in homogeneous material substances. This is a very important passage for this thesis, since it testifies to the fact that, as early as the 1250s, the two issues of *minima naturalia* and of *minima sensibilia* were explicitly linked by Latin commentators, and, what is more, that it was

[711] ROGERUS BACON, *Liber de sensu et sensato*, cap. 22, ed. STEELE, p. 111, ll. 21-27: "[...] tum quia eadem est natura totius homogenei et suarum partium, quelibet enim pars ignis est ignis, et pars sensibilis quelibet erit sensibilis; tum quia corpus dividitur in partes quarum quelibet est quantitativa, ergo a simili corpus sensibile dividitur in partes quarum quelibet est sensibilis; tum quia qua ratione una pars est sensibilis et alia, aut ergo quelibet aut nulla [...]."

not only the case that (as shown in the previous chapter) the text of *De sensu* 6 was quoted in commentaries upon *Physics* I.4, but also viceversa, the text of *Physics* I.4 was quoted in commentaries upon *De sensu* 6. Bacon's brief reference to *Physics* I.4, moreover, also provides additional evidence of the fact that the text is in fundamental agreement with the *Supra libros octo*'s discussion on *minima naturalia*. Indeed, Bacon claims:

> If, however, it is objected that [authority] of Aristotle in the first [Book] of the *Physics* [*Physics* I.4], where he takes a minimal flesh, it is nevertheless clear from that place that [Aristotle] does not mean to posit a minimal flesh simply and absolutely (*simpliciter et absolute*) according to his opinion, but it is taken here according to the opinion of Anaxagoras, i.e., according to sense, because he [i.e., Anaxagoras] posited that that is flesh in which more appears of flesh [compared with all its other infinite constituents] according to the sense, and since this appearance of the sense does not go to infinity, it will stop at a minimal flesh according to sense, and nevertheless [Aristotle] does not use this proposition if not as [a proposition that] from the [presuppositions] accepted by Anaxagoras conducts him to inconvenient conclusions there in multiple ways[712].

This passage contains two elements of Bacon's position on *minima naturalia* which featured prominently also in the discussion of the *Supra libros octo* that I have analysed in the previous chapter. First of all, Bacon clearly states (once again) that there are no *minima naturalia* in inanimate (homogeneous) substances *simpliciter et absolute*, therefore, no intrinsic *minima naturalia*. Secondly, he claims that Aristotle only seems to posit the existence of (intrinsic) *minima naturalia* in inanimate (homogeneous) substances in the text of *Physics* I.4, but what he is really doing is charging Anaxagoras with the claim that he should have posited the existence of (intrinsic) *minima naturalia* in inanimate (homogeneous) substances, and, since this is evidently false, so is the theory from which this conclusion stems. Bacon's argument is, in this passage, quite ellyptic, but it becomes immediately clear when one compares the text with the relevant passage from the *Supra libros octo* analysed in the previous chapter. Indeed, as Bacon stated in the *Supra libros octo*, if, according to Anaxagoras, although everything is present in everything, we distinguish different material entities due to the fact that there is a

[712] ROGERUS BACON, *Liber de sensu et sensato*, cap. 22, ed. STEELE, p. 112, l. 31-p. 113, l. 4: "Si tamen obiciatur illud Aristotelis in primo *Physicorum* ubi accipit carnem minimam, set planum est ex illo loco quod non intendit secundum oppinionem suam ponere carnem minimam simpliciter et absolute, set accipitur hic secundum oppinionem Anaxagore, scilicet secundum sensum, quoniam ipse posuit illud esse carnem in quo magis apparet de carne secundum sensum, et cum hec apparentia sensus non vadit in infinitum, stabitur ad carnem minimam respectu sensus, et tamen non utitur hac propositione nisi ut ex concessis ab Anaxagora ducat eum ad inconveniens ibi multipliciter."

prevailing component in them (a *maximum*, which is the component that we maximally perceive in them) then he should have also admitted that there is a *minimum* in them. The argument, however, as I noted in the previous chapter, is founded on a semantical ambiguity, namely, the confusion between an absolute and a relative use of the term *maximum*.

After this passage Bacon mostly sets aside the issue of *minima naturalia* in their own right, and he goes on to provide a more complete doctrine of *minima sensibilia*. This doctrine, nevertheless, turns out to be largely coincident with the position he adopted concerning *minima naturalia* in the *Supra libros octo*. In both texts, indeed, Bacon's considered position, the one that I have labelled of *minima secundum sensum*, is that there are no "intrinsic" *minima* in inanimate (homogeneous) material substances (neither *naturalia*, nor *sensibilia*)[713]. However, below a certain threshold of smallness, the external senses are not able to perceive the *species* multiplied from the sensible qualities (and, indirectly, from the substantial form) of the given material substance, therefore, below such a threshold, it is impossible to cognise the material substance at hand, including its substantial form. This impossibility, however, is only due to the limitations of the sensory powers, and not to a limitation on the side of sensible qualities themselves (and, indirectly, of the substantial form), which multiply their *species* when united with any quantity of matter whatsoever.

Nevertheless, the discussion of the *Liber de sensu*, when compared with that of the *Supra libros octo*, significantly enriches (and complicates) Bacon's doctrine of *minima secundum sensum*. Indeed, the second and the third objection against the idea that there are no "intrinsic" *minima sensibilia* in material substances provide important additions and specifications to the doctrine.

The second objection takes into account an aspect which, although absent from the text of *Physics* I.4 (so that Bacon did not consider it in developing his doctrine of *minima secundum sensum* in the *Supra libros octo*), features prominently in *De sensu* 6,

[713] Of course, in the case of *minima sensibilia*, the distinction between animate (heterogeneous) and inanimate (homogeneous) substances ultimately collapses (although a fuller discussion of the issue would require a consideration of the issue of the plurality of substantial forms in Bacon). Nevertheless, it is to be remarked that, throughout chapter 22 of the *Liber de sensu*, Bacon seems to be exclusively concerned with the latter case, probably due to the closeness, as I have already underlined, that he recognises between the discussion of *minima naturalia* he developed in the *Supra libros octo* and the one *on minima sensibilia* in the *Liber de sensu*. Nevertheless, for the sake of conceptual clarity and theoretical consistency, I will talk of *minima sensibilia* in material substances *tout court* throughout the rest of this section.

446a7-10, namely, the idea that extremely small portions of matter, once separated from the whole to which they belong, are corrupted by the action of the containing medium so as to lose their sensible qualities and acquire those of the medium. Of course, once this aspect is taken into account, the doctrine of *minima secundum sensum* proposed by Bacon must be qualified as a doctrine concerning "intrinsic" *minima sensibilia*, namely, a doctrine concerning what would happen in the division *per accidens* of sensible qualities *in the absence of* the corrupting action of the containing medium[714]. That Bacon understands his doctrine of *minima secundum sensum* in this way (and that therefore he does not deny that the action of the containing medium corrupts the sensible qualities associated with extremely small portions of matter taken in isolation) is already clear from a brief passage at the beginning of his discussion of *minima sensibilia*, where Bacon, presenting the arguments in favour of the view that there are no "intrinsic" *minima sensibilia*, states (considering the paradigmatic case of a primary quality) that "[…] coldness is not corrupted apart through [the action of] its contrary [element], therefore if water divided to infinity does not encounter the action of the contrary [element] in any part, the coldness will remain[715]." In the second objection that he introduces later in the chapter, however, Bacon considers the possibility that the corruption of sensible qualities might not only be caused by the action of the containing medium, quoting a passage from the *De caelo et mundo* where Aristotle affirms that fire (and therefore, *a fortiori*, its sensible qualities) is corrupted in two ways, namely, either for the action of the contrary element or due to its intrinsic weakness. Bacon's interpretation of this passage is important not only for his own understanding of the issue of *minima sensibilia* (and of *minima naturalia*) but also because it anticipates an argument that, as I have shown in the previous chapter, lies at the heart of Boethius of Dacia's criticism, in his *Physics* commentary, of the notion of *minima* (*naturalia*) *secundum formam*. Although, of course,

[714] Still, it is important to remark that the very limited role that Bacon assigns to the corrupting action of the containing medium throughout his entire discussion of *minima sensibilia* might suggest that he is conceiving the possibility that the threshold of perceptibility of sensible qualities is superior to the threshold of their corruptibility, so that what, in Aristotle, was a merely hypothetical debate concerning the existence of sensible qualities that are not perceptible in act (one confined to a possible world without the action of the medium), in Bacon would become a debate concerning the actual world. Unfortunately, there is no positive textual evidence for this view in Bacon's text, while, as I will show in the next chapter, this view grounds the innovative conception of *minima sensibilia* put forth by John of Jandun (some aspects of which are, nevertheless, partially anticipated by Bacon's discussion).

[715] ROGERUS BACON, *Liber de sensu et sensato*, cap. 22, ed. STEELE, p. 111, ll. 28-30: "[...] frigiditas non corrumpitur nisi per suum contrarium, ergo si aqua divisa in infinitum non accipiet actionem contrarii in qualibet parte, remanebit frigiditas."

I am not suggesting any direct connection between the two texts, it is evident that this argument (together with the reference to the Aristotelian *auctoritas* of the third chapter of the *De longitudine et brevitate vitae*, used both by Bacon here and later by Boethius of Dacia in his criticism of *minima naturalia secundum formam*) played a significant role in 13th-century (and, at least as a background assumption, also 14th-century) discussions of *minima*. Here is Bacon's presentation of the argument:

> If, instead, it is said that Aristoteles in the first [Book] of the *De caelo et mundo* [t. 59, 86] says that fire is corrupted in two ways, either through the [action of] the contrary [element] or lacking [sufficient strength] in itself such as a spark, and so it seems that it is possible to reach a [quantity of fire] so small that it will not be in the species of fire, it must be said that Aristotle does not say that sentence to present his own position (*determinando*), but [he] uses a habitual expression (*usuali sermone*) according to the common way of talking, […]; so, indeed, it seems that when water, that is truly the contrary [element] of fire, does not fall on fire, fire extinguishes by itself, such as daily when fire extinguishes in coals and ashes, but, however, it is not so, because the foundation (*fundamentum*) of natural philosophy is that all corruption happens through the action of the contrary [element], such as it appears primarily from the book *De morte et vita* [*De longitudine et brevitate vitae* 3, 465b7-9] and in other places. […]; and if it will not supervene a contrary [agent] or another dominating [agent], [the fire] will remain in its nature in act without corruption, talking of the corruption that is proper of natural entities, because, even though there is in matter an active potency to the contrary form and even though the privation [of the form instantiated in the natural entity considered] is annexed [to it], still this potency or privation neither rises nor grows over the form present in matter [in act] by itself and by its power, because it does not move if it is not moved and helped through [the action of] an external agent. The form, indeed, which is present in matter [in act] has more of being and act and power, with which it can resist to the evil of privation and can dominate over it, and this has to be especially considered in the corruption of [natural] entities[716].

[716] ROGERUS BACON, *Liber de sensu et sensato*, cap. 22, ed. STEELE, p. 113, ll. 5-17; 24-34: "Si vero dicatur quod Aristoteles in primo *Celi et Mundi* dicit quod ignis corrumpitur dupliciter, aut per contrarium aut deficiendo in se ut scintilla, et ita videtur quod tam parum potest accipi quod non erit in specie ignis, dicendum quod Aristoteles non dicit illud verbum determinando, set utitur usuali sermone secundum communem modum loquendi, [...]; ita enim videtur quod quando aqua, que est vere contrarium ignis, non cadit super ignem, quod ignis deficiat in se, ut cotidie quando ignis deficit in carbonibus et cineribus, set tamen non est ita, quoniam fundamentum Naturalis Phylosophie est quod omnis corruptio fit per actionem contrarii, sicut precipue patet ex libro *de Morte et Vita* et alibi. [...]; atque si non adveniret contrarium aut aliud dominans staret in sua natura in actu sine corruptione, loquendo de corruptione que debetur rei naturali, quoniam licet sit potentia activa in materia ad formam contrariam et licet privatio sit annexa, tamen non consurgit nec convalescit hec potentia vel privatio super formam presentem in materia de se et sua virtute, quia non movet nisi mota et adjuta per agens extra. Forma enim que est in materia presens plus habet de esse et actualitate et virtute, quibus potest resistere maleficio privationis et super eam dominari, et istud est valde considerandum in rerum corruptione."

Apart from the reference to the active potency of matter, an important aspect of Bacon's natural philosophy that, however, can be largely disregarded in the context of the present thesis, what truly matters in the passage is the fact that Bacon qualifies as the *fundamentum* of natural philosophy the principle according to which every corruption (of substantial and, *a fortiori*, of accidental forms) happens by the action of a contrary agent (and, generalising, of the containing medium; Bacon's discussion is, indeed, merely conducted at the level of the four elements and, correspondingly, of the four primary qualities). This formulation is much stronger than the one which will be later found in Boethius of Dacia (although it relies on the same Aristotelian auctoritas from the *De longitudine*), and it might therefore suggest that this argument is stronger in the first phase of the reception of Aristotle's natural philosophy, although it must be remarked that, both in the case of *minima naturalia* and in that of *minima sensibilia*, it will never be explicitly challenged during the 13th and the 14th century, apart from the case of some of those commentators, most prominently Thomas Aquinas, who will subscribe to the idea of *minima* (*naturalia* and *sensibilia*) *secundum formam*.

Bacon's discussion of the second objection also allows him to restate the basic idea of *minima secundum sensum* in its full import. Bacon, indeed, is very clear to state that *minima secundum sensum* are not (intrinsic) *minima a parte rei*, that is, on the side of the material substance under consideration; rather, they are only *minima a parte subiecti*, that is, on the side of the perceiving subject. This is to say that sensible qualities, according to Bacon, are always able to act (and, therefore, they are always "active"), regardless of the quantity of matter to which they are united. Nevertheless, below a certain threshold of smallness, the external senses, due to the limitation of sensory powers, are not able to perceive them anymore. This had already been explained by Bacon in the *Supra libros octo*, as I have shown in the previous chapter. In the context of his commentary on *De sensu* 6, after the discussion of the two kinds of corruption in the reply to the second objection, Bacon presents his position in the following way:

> If, indeed, the sensible can have [its] specific form and the sensible nature in any quantity [of matter], as it appears from what has been said [i.e., the reply to the second objection], then it must be understood that it can perform its operation in the medium, and in the sense, even though the sense does not perceive that through its

> species under any quantity. And this is the intention of Aristotle in this respect, [something] which is verified from the part of the sensible; […][717].

Finally, partially anticipating a discussion which would become prominent in the late 13th-century and early 14th-century debate on *minima sensibilia*, as I will show below, Bacon introduces, at the end of chapter 22 of the *Liber de sensu*, the third objection to his position according to which there are no "intrinsic" *minima sensibilia* in material substances. To be precise, the objection is directly addressed against the idea of *minima secundum sensum*. Indeed, Bacon remarks that one could argue that, if below a certain threshold of smallness sensible qualities are still able to operate, yet not to the point of being perceived by the external senses, then they would exist without a purpose (*frustra*). His reply to the objection is the following one, which introduces an important analogy:

> If, instead, it were objected [to the doctrine of *minima secundum sensum*] that then the sensible would exist without a purpose (*frustra*), and that it would multiply its species without a purpose (*frustra*), it must be said that even if the sensible did not have [any] relation (*respectum*) in [its] nature and in its action apart with the sense, it will not exist without a purpose (*frustra*). Indeed, even though a man does not laugh, and it never performs this operation, nevertheless [the property of risibility] will not exist [in him] without a purpose (*frustra*), because this property is assigned in aptitude (*aptitudine*), not in act, as Porphirius says [*Isagoge* 5]; and Aristotle says that man is capable of walking (*gressibilis*), even though it cannot walk, but [this holds] much more here, because the sensible is here posited to have its [proper] operation, which is the multiplication of species, even though the sense does not judge on that, whence the defect is on the part of the sense, not on the part of the sensible. Moreover, sensible entities (*sensibilia*) have other essential relations with respect to sense, inasmuch, that is, as they are parts of the world, whence intelligible entities are not said to exist without a purpose (*frustra*) even though they are not cognised. Similarly I say that sensible entities (*sensitiva*) do not exist without a purpose (*frustra*), even though they are not perceived[718].

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[717] ROGERUS BACON, *Liber de sensu et sensato*, cap. 22, ed. STEELE, p. 113, l. 34-p. 114, l. 4: "Si vero sensibile [in quacunque] poterit in quacunque quantitate habere formam specificam et naturam sensibilem, ut patet ex dictis, tunc intelligendum est quod poterit facere operationem suam in medium, et in sensum, licet sensus non sentiat illud per suam speciem sub quacunque quantitate. Et hec est intentio Aristotelis in proposito, quod verificatur a parte sensibilis [...]."

[718] ROGERUS BACON, *Liber de sensu et sensato*, cap. 22, ed. STEELE, p. 114, ll. 18-33: "Si vero obiciatur quod tunc sensibile esset frustra, et frustra multiplicaret speciem suam, dicendum est quod et si sensibile non haberet respectum in natura et actione sua nisi adhuc ad sensum, non erit frustra. Licet enim homo non rideat neque producat umquam hanc operationem, tamen non est frustra, quia proprietas hec assignatur in aptitudine non in actu, ut dicit Porphyrius; et Aristoteles dicit quod homo est gressibilis, licet non possit gradi, set multo magis hic, quoniam sensibile ponitur hic habere operationem suam, que est multiplicatio speciei, licet sensus non judicet de illa, unde defectus est a parte sensus non a parte sensibilis. Preterea, sensibilia habent alios respectus essentiales quantum ad sensum, in quantum scilicet sunt partes mundi, unde intelligibilia non dicuntur esse frustra licet non intelligantur. Similiter dico quod sensitiva non sunt frustra, licet non sentiantur."

Bacon's reply to the objection is based on an analogy between the property of being sensible as belonging to material substances and that of risibility as belonging to man (while the reference to the ability to walk is probably based on a peculiar choice of translation of the *translatio vetus* of *De sensu* 6). In both cases, Bacon notes, the property always inheres in (any) individual of the species considered, yet not insofas as it is actualised (indeed, its existence does not even imply that it will ever be actualised), rather only in aptitude (*aptitudine*). The example of risibility, and the reference to the concept of *aptitudo*, as Bacon explicitly acknowledges, is taken from Porphyry's *Isagoge*, and especially from the fourth chapter, where Porphyry distinguishes between four kinds of properties. The first is that of the properties that belong only to a species, but not to all the individuals of that species (such as the property of healing or being healed for man). The second is that of the properties that belong to all the individuals of a given species, but not only to that species (such as the property of being bipeds). The third is that of the properties that belong to a single species and to all the individuals of that species in a given "phase" of their existence (such as the property of whitening in old age). The fourth and final kind of properties is that of the properties that belong to a single species, and to all of its individuals, and that *always* exist in each of them. The example provided by Porphyry for this last kind of property is exactly that of risibility for man. Indeed, as Porphyry notes, although men do not always laugh, and although they can live without ever laughing, they always possess the aptitude (the Greek term is *epitēdeiotēs*, which Boethius translated as *aptitudo*) to laugh, an aptitude that they can always bring into act.

Bacon's analogy, evidently, is not devoid of problems. Indeed, as he notes in the opening of the passage just quoted, the property of being sensible is defined as a relational property, that is, a property which can only be understood by referring to a perceiving subject, and not exclusively to the perceivable object which is the subject to which the property belongs. This is not, instead, the case of risibility, which is a property which can be easily defined by making exclusive reference to the subject to which it belongs. By downplaying the relational character of the property of being sensible, therefore, Bacon moves some important steps away from a traditional Aristotelian conception of sensible qualities as qualities which are defined by their ability to act on the external senses (an aspect which I have already underlined at length throughout this chapter) and towards a

conception in which sensible qualities are entities which enjoy a higher degree of ontological and epistemological autonomy.

This new conception is also stressed by what Bacon affirms at the end of the passage quoted, namely, that the relation of sensible qualities to external senses is not only the (direct) relation of causing a perception, but also, indirectly, that of 'being part of the world'. What does Bacon mean with this apparently obscure remark? My idea is that here Bacon is simply claiming that sensible qualities have an (indirect) relation to the external senses inasmuch as they constitute the "building blocks", so to speak, of the perceptible world (and, at the same time, they also provide a "demarcation criterion" of the sensible world from the intelligible one; indeed, after all, the worry to lose a distinction between the sensible and the intelligible world features in both arguments in favour of the infinite divisibility of sensible qualities presented by Aristotle at the beginning of his discussion in *De sensu* 6). What is missing from the text, and, at the same time, would be needed in order to support my interpretation, is the idea that, even though sensible qualities are only present in aptitude in extremely small portions of matter, they can always be actualised if united with a sufficient quantity of matter endowed with the same sensible qualities. Bacon, unfortunately, does not talk explicitly of the conditions under which sensible qualities only present in aptitude in extremely small portions of matter can be actualised, but it seems fair to claim that the overall conceptual model that he proposes goes in this direction.

This model, therefore, partially anticipates the innovative understanding of sensible qualities which will be developed at the end of the 13th century and at the beginning of the 14th century by Medieval Latin *De sensu* commentators influenced by Alexander of Aphrodisias' reflections on the third meaning of 'potentially perceptible' presented above, according to which the sensible qualities associated with extremely small portions of matter (in the absence of the corrupting action of the containing medium) are potentially perceptible inasmuch as they can become perceptible in act by uniting with a sufficient quantity of matter endowed with the same sensible qualities. What is remarkable in this respect is the fact that Bacon arrived at (partially) analogous results without any knowledge of Alexander's commentary, only basing himself on the isolated remark made by Aristotle in *De sensu* 6, 446a10-15.

What, nevertheless, distinguishes Bacon from these later commentators is the fact that, although he makes use of the notion of 'aptitude' in a way which closely resembles the use of the third meaning of 'potentially perceptible' in Alexander and in the Medieval Latin commentators influenced by him, in Bacon sensible qualities are *always* "active", even when they are not able to be perceived by sensory powers, whereas the notion of 'potentially perceptible' at stake in Alexander and in his Medieval Latin followers is a notion where the sensible qualities of extremely small portions of matter are, so to speak, entirely "inactive" until they are united with a sufficient quantity of matter. Bacon himself, to be fair, seems to be oscillating between the two conceptions, insofar as the last passage quoted, and the whole analogy with the property of risibility, seem to suggest a conception of the activity of sensible qualities associated with extremely small portions of matter very close to the "Alexandrian" one. Nevertheless, the notion of *minima secundum sensum* previously articulated by Bacon throughout the chapter (and also in the *Supra libros octo*) clearly presupposes that sensible qualities remain active regardless of the quantity of matter with which they are united.

Regardless of this point, what Bacon's discussion of *minima sensibilia* shows beyond doubt is the fact that Bacon is adamant in stating his belief in the coextension of the natural world and of the sensible one. While this aspect is already entailed in the first argument that Aristotle presents in favour of the infinite divisibility of sensible qualities, it takes on a much greater importance in Bacon's thought, insofar as he explicitly denies the existence of intrinsic *minima naturalia* in inanimate (homogeneous) substances. The possibility of reaching, by division, portions of matter so small as to still be able to retain their substantial form but not their sensible qualities, apart from the fact that it would contradict a fundamental Aristotelian principle concerning the relation between a substance and its accidents (as mentioned above), would also risk admitting that there is a portion of the natural world which is, by nature, insensible. This possibility profoundly repugnates Bacon, and it is easy to understand why, given the importance he assigns especially to light and to its ability to make everything it reaches visible by activating the potency of colours[719].

[719] Cf. the following passage: "[...] set naturale est sensibile: omne enim corpus naturale est sensi<bi>le aut per lucem aut per qualitates alias sensibiles [...]" (ROGERUS BACON, *Liber de sensu et sensato*, ed. STEELE, p. 111, ll. 10-12).

Bacon, instead, sees as much more unproblematic denying the coextension between the sensible world and the perceptible one. These last considerations show that since the beginning of the reception of the *De sensu*, Medieval Latin commentators (even without knowledge of Alexander of Aphrodisias' commentary) started to challenge Aristotle's belief in the coextension of the sensible and of the perceptible world, an aspect which, as I will show below, is present not only in Roger Bacon's *Liber de sensu*, but also in Albert the Great's *De sensu et sensato*, to which I now turn.

3.5.3. The Early Medieval Latin Debate on *Minima sensibilia* in the Oxford Tradition: A Summary

Before moving on to Albert, a few words are in order concerning the very first phase of the Latin debate on *minima sensibilia*. Indeed, it is noteworthy that most of the central elements of the later debate are already present, *in nuce*, in this first phase, and it is therefore important to put them in sharper focus.

On the one hand, the *De sensu* commentaries by Adam of Buckfield and his circle, although they do not present an original position on *minima sensibilia* (they mostly restate the solution presented by Aristotle in the text of *De sensu* 6, 445b3-446a20), do introduce two elements that will be very important for the Latin debate on *minima sensibilia* as a whole. The first one is the distinction between being sensible *virtute* and being sensible *actione*. While this distinction, in these commentaries, still partially overlaps with Aristotle's distinction between being potentially and actually perceptible, it already foreshadows the distinction that will be formalised especially by Aspall in his *Physics* commentary, and that, as I will show below, will exercise a fundamental influence throughout the late 13th-century Oxford *De sensu* commentary tradition and even beyond. This distinction is the one based on the idea that an entity is sensible *virtute* when its sensible qualities are "active" towards the senses, yet without being able to engender a sensation, whereas an entity is sensible *actione* when the action of its sensible qualities is strong enough to engender a sensation in the senses.

The second important element introduced by the *De sensu* commentaries by Buckfield and his circle is the discussion of the idea that there must be a proportion between sensible qualities (or, better, their powers) and the corresponding sensory powers able to perceive

them. While this aspect will not be central to the later Oxford commentary tradition, it will find important developments in the Parisian debate on *minima sensibilia*, where it will be mostly formulated in terms of the principle that there must always be a correspondence between active powers and their corresponding passive ones in nature. This principle seems, indeed, to be violated by positing, as Aristotle does, that, at least in the absence of the corrupting action of the containing medium, there could exist sensible qualities that are not actually perceptible on their own (the third meaning of potentially perceptible). The later Parisian solution to this problem will focus on limiting the validity of the principle of correspondence of powers in nature to entities existing in a quantity of matter of sufficient dimensions. The solution provided by Buckfield and his circle, remarkably, is rather different, and it will not find any echo in the later *De sensu* commentary tradition. This solution is based on a limitation of the validity of the principle of correspondence of powers to entities that do not exhibit any ontological dissimilarity. Indeed, as Buckfield notes, insofar as sensible qualities are quantitatively divisible, even though only *per accidens*, while sensory powers are not, these entities are so different from each other in this respect that there is no reason why a correspondence between their powers should be maintained in case of the progressive division of sensible qualities.

Bacon's *De sensu* commentary is, differently from those associated with Buckfield and his circle, much more refined, bearing witness to a later stage of reception of this Aristotelian text. His discussion of *minima sensibilia*, in particular, is ramified and articulated. Bacon does not explicitly challenge Aristotle's solution to the issue of *minima sensibilia*, yet, he does develop an original position on the issue (one, moreover, that does not make any explicit recourse to the distinction between being potentially perceptible and being actually perceptible, or even merely between being sensible *virtute* and being sensible *actione*; a unique choice in the known Medieval Latin *De sensu* commentary tradition). This position, remarkably, gives a very limited role to the corrupting action of the containing medium. Bacon, indeed, conducts most of his discussion leaving aside the action of the medium (to the point that it might even be suggested that he takes the threshold of perceptibility of material substances to be superior to that of their corruptibility, as John of Jandun will later explicitly admit). His focus is on whether it is possible that there are portions of a material substance so small that they do not possess their own sensible qualities (be that in the actual world or in a possible world without the

corrupting action of the containing medium). Bacon, moreover, explicitly restricts his discussion to the case of homogeneous material substances. Indeed, insofar as an accident cannot exist without its proper subjects, and given that heterogeneous material substances certainly have *minima naturalia*, these *minima naturalia* necessarily act as *minima sensibilia* as well. Nevertheless, as Bacon had argued in his *Physics* commentary, insofar as in homogeneous material substances there are no ("intrinsic") *minima naturalia*, and insofar as, as Bacon states, a subject cannot exist without its proper accidents, in homogeneous material substances there should not be any *minima sensibilia* as well. The way Bacon frames his argument is therefore extremely important for this thesis insofar as it shows how close the debates on *minima naturalia* and on *minima sensibilia* were taken to be by commentators, already since the mid-13th-century. Still, Bacon is well aware that this position presents a problem: if sensible qualities are defined by their ability to act on the senses, how is it that, below a certain threshold of smallness, they can exist without being perceptible in act? Bacon's reply centres on the idea, again already present in his *Physics* commentary, that sensible qualities multiply their species in the medium when united with portions of matter of whatever size. If such species do not engender a sensation in the corresponding external senses, this is only due to the limitations of sensory powers themselves (this is the position that, in the previous chapter, I have labelled that of *minima secundum sensum*, in the context of the discussion of Bacon's doctrine of *minima naturalia*). In this way, Bacon rejoins Buckfield, and shows his adherence to the Oxford doctrine of *minima sensibilia*, by considering sensible qualities as entities that are always "active" towards the senses, even when they cannot be perceived in act.

Still, Bacon is also conscious (more than any early Oxford *De sensu* commentator) that this solution is not entirely satisfactory, insofar as it leaves open a problem. Indeed, if one accepts the Aristotelian principle according to which sensible qualities are defined by their ability to act on the senses so as to engender a sensation, sensible qualities that cannot be perceptible in act would be entities that exist without a purpose in nature, something that contradicts another fundamental Aristotelian principle (one which lies at the heart of Scholastic Aristotelian natural philosophy: *natura nihil facit frustra*). Bacon's solution to this issue is based on the idea that, on the one hand, insofar as sensible qualities still possess the property of being perceived by the senses in aptitude (*aptitudine*; Bacon

makes an interesting, albeit problematic, comparison with the property of risibility for man), such sensible qualities will not exist without a purpose. On the other hand, much more effectively, Bacon suggests that sensible qualities might not be exclusively defined by their ability to act on the senses so as to engender a sensation. Bacon is, unfortunately, very elusive at his point of his discussion. Yet, it seems rather clear that he is suggesting that the purpose of sensible qualities might also be that of providing a "demarcation criterion" of the natural world from the intelligible realm. If this were really what Bacon was saying, then his doctrine of *minima sensibilia* would (again) provide a close point of comparison for John of Jandun's later one, as I will show in the next chapter. Be that as it may, it is certain that Bacon's discussion of the 'purpose' of sensible qualities anticipates the late 13th- and early 14th-century Parisian debate concerning the relation between the essence of sensible qualities and their proper operation (i.e., that of acting on the senses so as to engender a sensation), and, more specifically, the debate concerning whether sensible qualities can exist without being able to perform their proper operation (and this, remarkably, without any knowledge of Alexander of Aphrodisias' commentary, which, as I will show, contributed to the emergence of the later Parisian debate).

3.6. Albert the Great on *Minima sensibilia*: Between Aristotle and Democritus

3.6.1. Albert the Great's Doctrine of *Minima sensibilia*

Leaving aside, for now, the Oxford *De sensu* commentary tradition, it is time to look at the commentaries produced on the continent. One of the first such commentaries is certain the one by Albert the Great.

Albert the Great's commentary on the *De sensu*, which, such as all other Albertinian commentaries on Aristotle, takes the form of a paraphrase, where the discussion of the passages of the corresponding Aristotelian text is complemented by digressions and *dubia*, has been critically edited by Silvia Donati in 2017 in the so-called *Editio Coloniensis* of Albert's works, together with Albert's *De nutrimento et nutrito* and by his commentary on the *De memoria et reminiscentia* (which Albert, such as later

Aquinas, considered to form, together with the *De sensu*, a single treatise divided in two parts, the first focusing on the external senses, and the second one on the internal ones)[720].

The dating on Albert's commentary on the *De sensu*, according to Donati[721], can be located between 1255/1256 and 1261/1263 at the latest. Donati bases her conclusion on the fact that the three works considered refer to Albert's *De anima* commentary (which can be safely dated between 1254 and 1257 at the latest) as concluded, for what concerns the *terminus post quem*, whereas the *terminus ante quem* is mostly established with reference to the dating on Albert's commentary on the *De animalibus* (*Historia animalium*, *De partibus animalium* and *De generatione animalium*), which Albert certainly composed after the three treatises edited by Donati, and whose composition can be dated either between 1258 and 1261 (according to A. Fries) or as concluded by 1258 (according to B. Schmidt). Nevertheless, also by referring to the dating of the composition of Albert's commentary on the *De motu animalium*, which was also written after the three treatises edited by Donati, and whose composition most likely started in 1256-1257, it can be safely assumed that a probable date for the composition of the three treatises edited by Donati (including Albert's commentary on the *De sensu*) is to be set between 1255/1256 and 1256/1257.

If this dating is correct, then Albert's commentary on the *De sensu* is situated at a critical juncture: while, indeed, most likely following Bacon's *Liber de sensu* (and the commentaries by Buckfield and his circle), it represents one of the very first commentaries (if not the first one) on this Aristotelian work to have been written on the continent (assuming that, when Bacon wrote his *Liber de sensu*, he had already returned to Oxford).

Interestingly, as I will show below, while Albert's discussion of the issue of *minima sensibilia* certainly presents some minor features in common with the early Oxford commentary tradition, it is fundamentally independent from it, and it presents innovative aspects that would have been greatly influential to the later *De sensu* commentary tradition (and not only) especially linked with the Parisian Faculty of Arts.

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[720] ALBERTUS MAGNUS, *Alberti Magni Ordinis Fratrum Praedicatorum De nutrimento et nutrito, De sensu et sensato cuius secundus liber est De memoria et reminiscentia (Alberti Magni Opera Omnia, Editio Coloniensis, Tomus VII Pars II.A)*, ed. S. DONATI, Münster i.W., Aschendorff Verlag, 2017.
[721] ALBERTUS MAGNUS, *De nutrimento et nutrito, De sensu et sensato cuius secundus liber est De memoria et reminiscentia*, ed. DONATI, p. v.

Albert structures his commentary on the *De sensu* in three tractates, loosely corresponding with the subjects of the various chapters of the *De sensu*. The third treatise ('in quo tractantur dubia communia quae sunt circa sensata') specifically concerns the three *aporiai* raised by Aristotle in *De sensu* 6-7. In particular, Albert devotes the first chapter of the third tractate to the *aporia* of the infinite divisibility of sensible qualities.

The first important element to notice in Albert's discussion is the fact that he interprets the whole issue of the infinite divisibility of sensible qualities as an objection raised by atomists (explicitly identified as the followers of Democritus and Leucippus) against Aristotle[722]. This choice has, of course, a textual basis in *De sensu* 6, insofar as, as seen above, Aristotle does indeed refer to the atomists' solution, after presenting the arguments in favour and against the infinite divisibility *per accidens* of sensible qualities, as an easy way out of the *aporia*, one, however, that cannot be accepted, due to the refutation of atomism Aristotle conducted most notably in *Physics* VI (and in *De generatione* I.2 and I.8).

Nevertheless, Albert decides to frame, since the outset of the chapter, the issue of *minima sensibilia* as a discussion between Aristotle and the atomists, rather than simply mentioning the atomists in connection with Aristotle's remark. This bears witness, I believe, to the constant attempt made by Albert to reconcile the atomists' position with Aristotle's one, an aspect which already emerged (in a more prominent position) in Albert's discussion of *minima naturalia* in his *Liber de generatione*, as I have shown in the previous chapter, where Albert came to the point of suggesting that Democritus' atoms are best understood as *minima naturalia secundum operationem*. In the context of the commentary on the *De sensu* Albert constantly tries to read Aristotle's doctrine of *minima sensibilia* in dialogue with the atomists' alternative model, yet the result is significantly different, as I will show below. The reason lies, probably, in the fact (repeatedly mentioned by Albert) that, concerning sensible qualities, there is a radical

[722] Cf. ALBERTUS MAGNUS, *De nutrimento et nutrito, De sensu et sensato cuius secundus liber est De memoria et reminiscentia*, I, tract. 3, cap. 1, ed. DONATI, p. 92, l. 15-p. 93, l. 5: "Et de primo [i.e., the issue of the infinite divisibility of sensible qualities] quidem *obiciet* forte *aliquis* sequens Democritum et Leucippum dicens quod *si omne corpus in infinitum* divisibile est, *et* ista sensibilia sunt formae corporeae divisibiles subiecto suo diviso, oportebit etiam quod ipsae *passiones sensibiles* in infinita dividantur, sicut *color*, *chymus*, *odor*, gravitas, *sonus*, *frigidum*, *calidum*, *asperum* et *lene*, durum et *molle*, et alia quaecumque sunt sensibiles passiones. Si autem in infinita dividantur, tunc etiam oportet ut ex infinitis componantur, et sic erunt atomi sensibiles, aut oportet quod passiones nihil sint, sed resultent in sensu ex ordine et situ et figura atomorum."

ontological difference that grounds the incompatibility between the Aristotelian and the atomists' model, namely, the fact that, while Aristotle treats sensible qualities as entities in their own right, the atomists consider them only as a deceptive appearance of the senses without any ontological consistency, since the cause of this appearance is only to be found in the differences in position, order and shape of the atoms[723]. A conciliation between the two positions, therefore, would have required a much more "innovative" and daring conceptual model than the mere combination between *minima naturalia secundum operationem* and Democritean atoms applied in the *Liber de generatione* to the case of material substances more generally. It is exactly such a model that one finds in the subsequent passages of Albert's discussion of *minima sensibilia*, to which I now turn without further ado.

After presenting the arguments discussed by Aristotle in favour and against the infinite divisibility *per accidens* of sensible qualities, Albert, following the order of the Aristotelian text, turns (preliminarily) to the issue of the infinite divisibility *per se* of sensible qualities, that is, of their divisibility in species within genera. While Albert mostly adheres to the argument presented by Aristotle in the text to prove that the species of sensible qualities are finite in number within each genus (the one based on the contrariety of their extremes), he also originally links it with the issue of how the middle species of each sensible qualities are generated. This is an ingenuous move, since, in this way, Albert manages to link the issue of the infinite divisibility *per se* of sensible qualities with the one of their infinite divisibility *per accidens*, an aspect which remains problematic in the Aristotelian text, as I have said above. Indeed, in his previous

[723] Cf. for instance, the following passages: "*Simul* autem cum istis inductis dubiis *omnia* dicere sensibilia *sic se habere* quod componantur ex indivisibilibus et insensibilibus *videtur* ferre testimonium *illis qui* principia corporum naturalium *faciunt* esse *indivisibiles magnitudines* et corpora. Et si *sic* sit, tunc *solvetur sermo* disputationis inductae dicendo sensibile componi ex insensibili, et quod hoc non sit inconveniens, eo quod sensibilis forma in se nihil est, sed tantum est secundum apparentiam sensus, quae apparentia sensus causatur ex situ et ordine et figura atomoroum, sicut diximus in primo libro *De generatione*. *Sed hoc* est *impossibile*. *Dictum est enim in* sermonibus de motu in sexto *Physicorum* quod impossibile est aliquid componi ex indivisibilibus" (ALBERTUS MAGNUS, *De nutrimento et nutrito, De sensu et sensato cuius secundus liber est De memoria et reminiscentia*, I, tract. 3, cap. 1, ed. DONATI, p. 93, ll. 62-74); "*Dicendum* autem *est* quod *passiones* sensibiles *sunt species* in natura, licet hoc negaverit Democritus, qui dicebat eas vere non esse in rerum natura, sed in apparentia sensum tantum, sicut diximus supra" (*ibid*., p. 94, ll. 50-53). But cf. also earlier, in Albert's commentary, Liber I, tract. II, cap. 8, 'De falsis opinionis quae sunt circa sensibilia': "Et huius causa est quia ipse [i.e., Democritus] dixit nullam esse formam sensibilem omnino, sed videri eas ex compositione et ordine et situ atomorum diversas figuras habentium. Et hoc dixit tangere sensum et perficere sensualitatem secundum actum" (*ibid*., I, tract. II, cap. 8, ed. DONATI, p. 79, ll. 20-24).

discussion of the formation of middle colours, Albert had argued that the middle species of sensible qualities are formed by the alteration and the composition of natural bodies (material substances) that contain the extreme species of the same genus of sensible qualities. In this way, the problem of the formation of the middle species of sensible qualities supervenes on the problem of how the bodies in which the extreme species of the same genus of sensible qualities are contained are divided. Indeed, Albert applies the two kinds of division of a continuous body referred to by Aristotle in the text of *De sensu* 6, i.e., that in equal and that in unequal parts, to the issue of the formation of the middle species of sensible qualities. When, Albert claims, the bodies containing the extreme species of a given genus of sensible qualities are divided in (finite and actually existing) equal parts, these equal parts combine (in a specific proportion) to form a given kind of middle species of the same sensible quality. When, instead, such bodies are divided in unequal parts, these parts (that are infinite in number and that can, therefore, only exist in potency) could, only in potency, give rise to an infinite number of middle species of the same sensible quality, but, in act, they do not generate any middle species of the same sensible quality, so that the bodies only retain the original extreme species of the same sensible quality[724].

After having determined the issue of the infinite divisibility *per se* of sensible qualities, Albert moves to the main issue of the chapter, namely, the infinite divisibility *per accidens* of sensible qualities. Albert's solution, contrary to Bacon's one, is based on the distinction between the act and the potency of sensible qualities, and, more precisely, of their perceptibility. Although, as seen above, already Adam of Buckfield (or his circle) had developed an account of *minima sensibilia* in basic hylomorphic terms, in Albert the distinction between 'being actually perceptible' and 'being potentially perceptible' becomes the cornerstone of the discussion. What is more, in Albert's text, contrary to the "deviant interpretations" of the early Oxford commentary tradition, the dichotomy

[724] ALBERTUS MAGNUS, *De nutrimento et nutrito, De sensu et sensato cuius secundus liber est De memoria et reminiscentia*, I, tract. 3, cap. 1, ed. DONATI, p. 94, ll. 53-67: "Diviso autem continuo per aequalia, semper est connexio sensibilium ex his dividentibus, quod est per modum quem diximus supra, ut scilicet duae tertiae vel quartae perspicui connectantur cum quinque quintis vel sextis vel decimis opaci vel aliter quocumque modo, et ex taliter per divisionem acceptis, cum finita sint, eo quod sunt aequalia, media sensibilia resultabunt finita, et similiter est in aliis subiectis sensibilium. Si autem connexio fiat ex inaequalibus praeter proportionem acceptis, ut scilicet minus de perspicuo connectatur cum maiori de opaco inaequaliter et inaequalibus, erunt colores asymmetri et infiniti secundum potentiam, et idem omnino iudicium est de sensibilibus aliis. Et sic patet qualiter species sensibilium dupliciter sunt finitae."

between *virtus* and *actio* (the two terms with which the *translatio vetus* translates *dynamis* and *energeia* respectively in the context of *De sensu* 6) is strictly interpreted as equivalent to that between *potentia* and *actus*[725].

Albert explains the distinction between 'being perceptible in act' and 'being potentially perceptible' by reference to the two examples adopted by Aristotle in the text, namely, the ten-thousandth part of the millet seed and the *diesis*. In this way, Albert explains the notion of 'being potentially perceptible' primarily with reference to the first (but also to the third) meaning that I have distinguished above, namely, as referring to the parts of a given whole too small to be perceptible on their own, yet potentially perceptible insofar as they contribute to the perception of the whole to which they belong. Nevertheless, Albert interprets the Aristotelian examples in an innovative way. Indeed, probably influenced by the fact that the *diesis*, in the early Latin *De sensu* commentary tradition (yet not in Aristotle, as I have shown above), was considered the "minimal part", so to speak, of a melody (as the distance between two points of it as close to each other as possible for them to exist in act)[726], he understands Aristotle as claiming that, when the division of a continuous entity such as a millet seed or a melody reaches its *minima*, such *minima* are only potentially perceptible in the whole to which they belong in the first

[725] ALBERTUS MAGNUS, *De nutrimento et nutrito, De sensu et sensato cuius secundus liber est De memoria et reminiscentia*, I, tract. 3, cap. 1, ed. DONATI, p. 94, l. 70-p. 95, l. 3: "Solutio *autem* quaestionis principalis est quod debemus supponere et *sumere* ab his quae saepe demonstrata sunt in *Physicis quod* in physicis aliud est quod est potentia et *virtute et aliud* quod est *actione* sive actu. Similiter igitur sensibilium aliud est virtute sensibile et aliud sensibile secundum actum, sicut in visu [...]." Note that, since the two couple of terms are clearly interpreted as syonyms by Albert in the context of his commentary on *De sensu* 6, 445b3-446a20, I translate both *potentia* and *virtute* as 'in potency', and *actu* and *actione* as 'in act', unless the two terms forming a synonymic pair occur together (in this case I translate each of them according to its literal meaning). Moreover, it is noteworthy, be it said incidentally, that Albert in this passage (as in many others of the chapter) refers the reader back to the *Physics*. This provides additional evidence to the idea that the text of *De sensu* 6 was frequently read against the background of the *Physics*, although Albert does not mention specifically the debate on *minima naturalia* as discussed in the commentary on *Physics* I.4.

[726] See the texts quoted by Silvia Donati, the editor of Albert's *De sensu* commentary, in the *apparatus fontium* in correspondence with this passage (cf. ALBERTUS MAGNUS, *De nutrimento et nutrito, De sensu et sensato cuius secundus liber est De memoria et reminiscentia*, I, tract. 3, cap. 1, ed. DONATI, p. 95, n. 7-8). Donati includes the first *recensio* of Adam of Buckfield's commentary (cf. ADAM DE BUCKFIELD, ms. Oxford, Balliol College, 313, f. 142ra: "[...] sonus qui est in diesi, quod dicitur neupma duorum punctorum sive minimum in sonis [...]"), and also the anonymous gloss on the *De sensu* in ms. London, British Library, Royal 12.G.III, f. 251v ("*Diesis* est minimum in sono quod propter parvitatem non potest movere sensum per se"; this latter text, however, still seems to remain closer to the original Aristotelian understanding of the *diesis* as the smallest interval of a melody that is perceptible in actuality on its own). Donati, moreover, appropriately notes that Aquinas will understand the diesis in the same way in his *Sentencia libri de sensu et sensato* (cf. THOMAS DE AQUINO, *Sentencia libri de sensu et sensato, cuius secundus tractatus est De memoria et reminiscentia*, ed. GAUTHIER, I, tract. 1, cap. 14, *ibid*., p. 79, ll. 182-183, with footnote *ad loc*.).

meaning mentioned above and, if they were separated from it, they would only be potentially perceptible in the sense that they would not be able to be perceived (not even indirectly), yet retaining their sensible qualities. Albert, therefore, hints at the third meaning of potentially perceptible detailed above, although, in this passage – he will do it later – he does not explicitly acknowledge that such sensible qualities would become perceptible anew in act when united with a sufficient quantity of matter endowed with the same sensible qualities. Albert's crucial passage is the following one:

> And even though the millet seed that exists complete and continuous is seen in act, still the distance of its minimal parts (*minimarum partium*) that is between, i.e., that is the interval (*medium*) between the last [parts] (*ultima*) reached by division goes unperceived and escapes [the sense] in act. Similarly, however, also in the other sensibles [the parts] that are extremely small (*omnino parva*) escape the sense in act; such [parts], however, are sensible and visible by power and in potency (*virtute et potentia*), but not in act, when by division are separated to the *minima*[727].

Albert's passage is dense and not immediately perspicuous. The most important aspect to understand is what Albert means when he refers to the *minima* of the sensibles (and to the distance between their minimal parts, clearly referring to the example of the *diesis*), as the parts of a sensible whole that are only sensible *virtute et potentia* and that, as such, are not perceptible in act.

Various interpretations of Albert's notion of *minima* (Albert will later talk, more specifically, of *'ultima minima*') could be possible. Yet, without wanting to venture any definitive proposal, what I think should be recognised is that, regardless of how one interprets these expressions, Albert is clearly referring to a minimal extension of matter capable of existing in act, and to the sensible qualities united to it[728]. If this is so, then, it is extremely hard to deny that, according to Albert's model, such *minima* represent the ultimate constituents of sensible qualities. These constituents (as Albert will go on to detail in the following part of the chapter), however, are not perceptible in act, while the

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[727] ALBERTUS MAGNUS, *De nutrimento et nutrito, De sensu et sensato cuius secundus liber est De memoria et reminiscentia*, I, tract. 3, cap. 1, ed. DONATI, p. 95, ll. 10-18: "Et quamvis milium integrum et continuum existens videatur secundum actum, sed *distantia* minimarum partium eius quod interest, hoc est: medium est, *ad ultima* accepta per divisionem *fallit* sensum et latet secundum actum. *Similiter autem et in aliis sensibilibus* quae sunt *omnino parva* latent sensum secundum actum; talia tamen sunt *virtute* et potentia sensibilia et *visibilia*, sed *non actione, quando* per divisionem ad minima *sunt separata*."

[728] Such "smallest extension", it should be remarked, does not seem to be identified by Albert according to any limit on the side of the substantial form of the material substance concerned (therefore not according to any notion of *minima naturalia*), but rather merely by appeal to the limit to the actual division of the matter itself of such a substance.

portions of sensible qualities greater than them are. Yet, if my interpretation is correct, what are the features that Albert attributes to these *minima*, especially in comparison to greater portions of a given material substance (and their sensible qualities)?

The first aspect to underline is that, on Aristotle's model, as shown above, the *minima* (such as all extremely small portions of a given material substance) should be corrupted by the containing medium if they were separated from the whole to which they belong, and, as such, their existence independently of the whole to which they belong could only be thought of in counterfactual terms. Contrary to Aristotle, however, and also to virtually all the previous commentary tradition on *De sensu* 6, however, Albert makes no mention whatsoever, throughout his commentary, to the corrupting action of the containing medium[729]. Therefore, on his model, the distinction between "extrinsic" and "intrinsic" *minima sensibilia* does not play any role, and the discussion of the *ultima minima* as the ultimate components of sensible qualities is conducted entirely as a discussion concerning the actual world and not merely a possible one without the corrupting action of the containing medium.

[729] Instead, when commenting upon 446a7-10, where Aristotle refers to the corrupting action of the containing medium with the example of the drop of a flavourous liquid poured into the sea, Albert, following a manuscript witness of the *translatio vetus* he is using, reads *odor* instead of *sapor* and, especially, *infusus nari* instead of *infusus mari*, so that the result is that, in his reading, Aristotle is not mentioning the corrupting action of the containing medium, but rather the perception of an extremely small odour by the corresponding sense organ: "Ergo multo magis, quando *separantur superhabundantiae* sensibilium quae possunt agere in sensum, tunc rationale est ea separari et dividi in contingentia sensibilia, quae sunt sensibilia potentia et virtute, *velut necnon* separatur et dividitur *subtilissimus infusus nari*, qui est *odor* parvissimus; hoc enim dividitur in ea quae virtute et potentia odores sunt, et haec sunt contingentia odorabilia" (ALBERTUS MAGNUS, *De nutrimento et nutrito. De sensu et sensato cuius secundus liber est De memoria et reminiscentia*, I, tract. 3, cap. 1, ed. DONATI, p. 95, ll. 22-29; compare the passage with the corresponding one in the *translatio vetus*, which I also quoted above: "Separatis igitur tunc superhabundantiis rationabiliter et resolvuntur in continentia, velud subtilis chimus mari infusus", ARISTOTELES, *De sensu et sensato. Translatio vetus*, ed. PEETERS). This is not the place to determine whether, ultimately, Albert was misled by a manuscript witness of the *translatio vetus* or he deliberately chose a reading more consistent with his overall interpretation. Moreover, lacking the complete critical edition of the *translatio vetus* of the *De sensu* it is very difficult to understand how widespread such a variant might have been in the textual tradition. Nevertheless, it is a fact that a reading substantially analogous to Albert's one was present in the textual tradition of the *translatio vetus* of the *De sensu*. Cf, for instance, ARISTOTELES LATINUS, *De sensu et sensato (translatio anonyma)*, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Urb. Lat. 206, f. 330v: "Separatis igitur nunc superhabundanciis racionabiliter e[c]ciam resolvuntur in continencia velud fumus subtilissimus [in] nari infusus". Importantly, this manuscript is dated to the mid-13th century, and presumably before the composition of Albert's paraphrase of the *De sensu* (cf. *Aristoteles Latinus. Codices: Pars Posterior et Supplementa (Corpus Philosophorum Medii Aevi)*, codices descripsit G. LACOMBE, in societatem operis adsumpsit A. BIRKENMAJER, M. DULONG, AET. FRANCESCHINI, supplementis indicibusque instruxit L. MINIO-PALUELLO, Cambridge, Cambridge University Press, 1955, pp. 1204-1205).

To this, one should also add that Albert, by relying on an epistemological model which is extremely optimistic, also explicitly claims that all quantities of a material substance greater than the "minimal extensions" represented by the *ultima minima* can be actually perceived, not only in the whole to which they belong, but also while existing separately from it[730].

What is more difficult to ascertain, at least from the passage quoted above, where the notion of *minima* is introduced, is what happens, according to Albert, to such *minima* once they are separated from the whole to which they belong, considering, as I have said, that Albert does not refer to the corrupting action of the containing medium. His interpretation seems to be the following. When the part of a sensible whole greater than the minimal ones is separated from it (what Albert refers to, using the term adopted by Aristotle in *De sensu* 6, as a '*superabundantia sensibilium*'), such a part (that is potentially perceptible in the second meaning) can be perceived in act on its own. Even if such a part were divided into smaller and smaller ones, they would still be able to be perceived in act on their own (as I have already pointed out above). When, however, a sensible whole is divided into what Albert calls its *ultima minima*, referring, I believe, to its minimal extensions (therefore to the *minima* mentioned above), then such *ultima minima* (which are potentially perceptible in the third meaning) cannot be perceived in act, once they are separated from the whole to which they belong; yet, they retain their sensible qualities (although in a peculiar metaphysical state), and they will become again perceptible in act once united with a sufficient quantity of matter. As Albert synthesises his interpretation:

> Let us say therefore that it [i.e., a material substance] is first divided in those [parts] that are sensible [in act on their own]; then it will be [divided] in a more fine-grained sensible superabundance (*in discretiori superabundantia sensibili*). And [even] through this division the sensible is not separated in non-sensibles, because it is still [possible] to perceive these [parts] in act; and therefore, even though it is so divided, nevertheless it is still sensible [in act]. And if again it [i.e., such a part] is divided further and further so long, until it loses the excess (*superabundantiam*) [required]

[730] ALBERTUS MAGNUS, *De nutrimento et nutrito, De sensu et sensato cuius secundus liber est De memoria et reminiscentia*, I, tract. 3, cap. 1, ed. DONATI, p. 95, ll. 29-38: "*Sed* quia *superabundantia sensus*, quae actu agit in sensum <et> est superabundantia eius quod est *sensibile secundum* seipsum per essentiam, non est *separata* ad minima – iam *enim virtute* et potentia suae divisibilitatis est *in discretiori*, hoc est in amplius divisa, *superabundantia*, quae est sensibilis etiam secundum actum, sicut et superabundantia prior quae in ipsam divisa est, ita tamen quod *sensibile* non est *separatum* ad ultima minima –, *erit* illam superabundantiam *sentiri*."

> to move the sense, [it] is nevertheless still sensible in some way; this is, indeed, already sensible in potency (*virtute*), and [it] will be sensible in act (*actione*) when it will be completed through the union with another [portion of a material substance] with which it achieves the excess (*superabundantiam*) [required] to move the sense. In this way therefore the sensible in act (*secundum actum*) is composed of entities that are not sensible in act, which are nevertheless sensible in potency, in which there is a beginning of the forms of the sensibles (*inchoatio formarum sensibilium*). And so it does not follow that some [one] of the sensibles is made out of nothing or of mathematical entities[731].

What is truly remarkable in this passage is that, without any knowledge of Alexander of Aphrodisias' commentary, rather merely relying on Aristotle's remark at 446a10-15, Albert provides a "corpuscularian" (and almost "Alexandrinist") characterisation of sensible qualities which goes exactly in the same direction (I will come back to this aspect in a moment). True, also Bacon had attempted a similar development a few years before Albert. However, in Albert the refined understanding of the various meanings of 'potentially perceptible' entailed by the Aristotelian text has the consequence that the (thoroughly hylomorphic) model he proposes is much more structured and theoretically richer than Bacon's one. Moreover, Bacon never interpreted his model as a model describing the actual composition of sensible qualities that are perceptible in act, so that no "corpuscularian" element whatsoever could be identified in his discussion of *minima sensibilia*. Even more than this, as noted above, Bacon, differently from Albert, fully recognises the role of the corrupting action of the containing medium in his discussion of *minima sensibilia* (although some ambiguities on whether this prevents the existence on their own of sensible qualities that are not perceptible in act remain).

Albert's "corpuscularian" model of the composition of sensible qualities that are perceptible in act, nonetheless, is founded upon the use of a rather idyosincratic concept that sets it apart from the model developed by Alexander and that will be later followed by the Medieval Latin commentators influenced by him, so much so that, in order to be

[731] ALBERTUS MAGNUS, *De nutrimento et nutrito, De sensu et sensato cuius secundus liber est De memoria et reminiscentia*, I, tract. 3, cap. 1, ed. DONATI, p. 95, ll. 43-58: "Dicamus igitur ipsum dividi primo in ea quae sensibilia sunt; tunc erit in discretiori superabundantia sensibili. Nec per istam divisionem sensibile separatum ad insensibilia, quia est adhuc ista actione sentiri; et ideo licet ita divisum sit, tamen est adhuc sensibile. Et si iterum ulterius et ulterius dividatur ita diu, donec amittat superabundantiam movendi sensum, *est tamen* adhuc aliquo modo *sensibile*; hoc *enim virtute iam est* sensibile, *et* est *actione* sensibile quando *est perfectum* per compositionem cum alio cum quo accipit superabundantiam movendi sensum. Sic igitur sensibile secundum actum componitur ex insensibilibus secundum actum, sensibilibus tamen secundum virtutem, in quibus est inchoatio formarum sensibilium. Et sic non sequitur aliquod sensibilium fieri ex nihilo aut ex mathematicis."

able to assess it properly, a detailed analysis of such concept is needed. Indeed, in the closing of the passage, in order to explain in what way the *ultima minima* possess the accidental forms of sensible qualities without being perceptible in act (but only being potentially perceptible in the third sense), Albert makes use of the notion of the *inchoatio formarum sensibilium*. Now, although the notion of the *inchoatio formae*, i.e., of the 'beginning of form' already present in matter (both prime matter and the matter of already existing hylomorphic compounds), is a fundamental feature of Albert's metaphysics and natural philosophy, such notion is never, to my knowledge, applied by Albert to the accidental forms of sensible qualities in their own right, but rather only to substantial forms. In this sense, the use of the notion to refer to the accidental forms of sensible qualities in this passage does not seem to find any direct correspondence in the entire *corpus* of Albert's extant writings (correlatively, also the expression of *inchoatio formarum sensibilium* appears to be a *hapax legomenon* in such a *corpus*). Such a situation calls for a wider reflection on Albert's use of the notion of the *inchoatio formarum sensibilium* in comparison with Albert's use of the notion as applied to substantial forms: this seems, indeed, the best way to understand the defining features of the former concept.

Evidently, it is not possible to detail here the complex role that the notion of the *inchoatio formae* habitually plays in Albert’s metaphysics and natural philosophy. Nevertheless, a very brief presentation of the concept is necessary in order to understand in what way the *inchoatio formarum sensibilium* referred to by Albert in the passage quoted above is similar to it and in what ways it fundamentally differs from it. By having recourse to the concept of the *inchoatio formae* (a notion loosely derived from Augustine's doctrine of the *rationes seminales* and employed in a similar vein by some of Albert's contemporaries, such as Bonaventure), Albert refers to what he takes to be one of the fundamental metaphysical features of matter, both prime matter and the matter of hylomorphic compounds. Albert describes the *inchoatio formae* as an active potency of matter and as a formal feature inhering in it, more precisely as "something of the form" (*aliquid formae*), i.e., as identical in essence, but different in *esse* (having an "incomplete" being), in comparison with the substantial form matter will be informed by at the end of a process of substantial change. Such *aliquid*, according to Albert, is inserted in matter through the action of a complex causal chain, starting with the influence of the celestial

intelligences. The *inchoatio formae*, however, never takes away the role of the external natural agent as efficient cause of substantial change. In Albert's view, therefore, substantial change is understood as the process through which the *inchoatio* of a substantial form present in matter is educed from it through the action of an external agent informed by the same substantial form in its "complete" being[732]. How does (if it does at all) the notion of the *inchoatio formae*, when applied to the accidental forms of sensible qualities in the passage quoted above, differ from Albert's use of the concept with reference to substantial forms, and how (if at all) is it similar (and even analogous) to it?

Unfortunately, Albert does not elaborate any further onto the notion of the *inchoatio formarum sensibilium*, so the answer to this question cannot be entirely deprived of a certain degree of speculation. However, what Albert says about it in the last passage quoted seems to be enough to provide at least a partial answer. First of all, it is clear that the *inchoatio* of the accidental forms of sensible qualities is interpreted by Albert as a formal entity that is identical in essence to the accidental forms of sensible qualities themselves, otherwise it would be impossible to claim that the parts of a sensible

[732] The fundamental study on Albert's *inchoatio formae* (where all the main aspects of this presentation are already well developed) is B. NARDI, "La dottrina d'Alberto Magno sull'*inchoatio formae*", *Rendiconti della classe di scienze morali, storiche e filologiche. Accademia dei Lincei*, ser. VI (12), 1936, pp. 3-38, reprinted in ID., *Studi di filosofia medievale*, Roma, Edizioni di Storia e Letteratura, 1960, pp. 69-102. Nardi's interpretation of the *inchoatio formae* as a fundamentally active, formal determination of matter has been contested in S.C. SNYDER, "Albert the Great, *Incohatio Formae*, and the Pure Potentiality of Matter", *American Catholic Philosophical Quarterly* LXX, 1996, pp. 63-82 (also making reference to J. A. WEISHEIPL, *The Axiom* opus naturae est opus intelligentiae *and Its Origins*, in G. MEYER, A. ZIMMERMANN (ed.), *Albertus Magnus*, Doctor universalis *1280-1980*, Mainz, Matthias-Grunewald Verlag, 1980, pp. 441-463). Steven Snyder claims that, far from being an active potentiality of matter (and a positive formal determination of it), the *inchoatio formae* is merely identified by Albert as referring to a purely passive potentiality of the matter of hylomorphic compounds that, alongside the pure potentiality of prime matter, explains how the matter of hylomorphic compounds is able to receive only certain forms and not others, therefore providing the key element to explain the order and regularity evident in successive cycles of generation and corruption. In Snyder's interpretation, therefore, Albert becomes a Thomist who is fundamentally opposed to any idea of an active potentiality of matter: matter is, for Albert as for Aquinas, pure passivity. Snyder's criticisms, however, have been recently rejected, I believe in a convincing way, in Anna Rodolfi's important study of Albert's notion of matter, which, in a synthetic yet fundamental section, sometimes restating Nardi's points and drawing on the same texts, sometimes adding important new textual evidence to the debate, demonstrates clearly that, although it is true that the doctrine of the *inchoatio formae* grounds the order and regularity of the successive cycles of generation and corruption in nature, Albert interprets it as an active potentiality of matter that is educed from matter itself thanks to the action of an external natural agent (cf. A. RODOLFI, *Il concetto di materia nell'opera di Alberto Magno (Corpus Philosophorum Medii Aevi. Testi e studi 18)*, Firenze, SISMEL–Edizioni del Galluzzo, 2004, pp. 110-125). On the affinity between Albert's doctrine of the *inchoatio formae* and Avicenna's doctrine of the "preparation" or "appropriate preparation" of matter see also O. LIZZINI, *Flusso, preparazione appropriata e* inchoatio formae*: brevi osservazioni su Avicenna e Alberto Magno*, in M. LENZI, C. MUSATTI, L. VALENTE (eds.), *Medioevo e filosofia. Per Alfonso Maierù*, Roma, Viella, 2013, pp. 129-150, which also presents some important remarks on the differences between the various interpretations of the doctrine in the secondary literature referred to above.

whole possessing the *inchoatio* of the accidental forms of sensible qualities, yet not the accidental forms themselves, are sensible in their own right (albeit only *virtute*). On the contrary, the very fact that the portions of material substances endowed with the *inchoationes formarum sensibilium* are not able to act onto the senses so as to engender a sensation (and therefore do not possess the proper operation of sensible qualities), contrary to the portions of material substances endowed with the accidental forms of sensible qualities, suggests that such *inchoationes* have an "incomplete" *esse* in comparison with that of the accidental forms of sensible qualities themselves.

If this interpretation is correct, therefore, the *inchoatio formarum sensibilium* shares with the *inchoatio* of substantial forms two fundamental metaphysical aspects, i.e., an essential identity with the corresponding form and an existential difference from it founded upon the opposition between a "complete" and an "incomplete" being. Nevertheless, are the two notions really employed by Albert in an analogous way? One might legitimately doubt it, by considering the process through which, in both cases, from the "incomplete" being of the *inchoatio* the corresponding formal entity possessing a "complete" being is produced. Indeed, the *inchoatio* of a substantial form, as characterised by Albert, requires the action of an already "complete" substantial form as the external causal agent that educes it from matter (therefore bringing it from "incomplete" to "complete" being), whereas this does not seem to be the case for the *inchoationes* of the accidental forms of sensible qualities. Indeed, as Albert makes clear in the last passage quoted above, the *inchoationes* of the accidental forms of sensible qualities only require the *compositio* (which, in this context, I take as meaning the 'union') with a sufficient quantity of other portions of material substances endowed with the *inchoationes* of the same sensible qualities in order to come to form, together, a "complete" accidental form of a sensible quality, that is, a form that is capable to perform its proper operation to act onto the external senses so as to engender a sensation, without the need for any already "complete" external causal agent[733].

[733] Note that this interpretation of the notion of the *inchoatio formarum sensibilium*, if correct, has also an important consequence for what concerns Albert's overall picture of the sensible world. Indeed, as said, all the previous commentary tradition on *De sensu* 6, while generally amenable to at least conceive the possibility (as a hypothetical) of denying the principle of the coextension of the sensible and of the perceptible world, strongly rejected the possibility of denying the principle of the co-extension between the natural and the sensible world, reminiscent of Aristotle's arguments presented at the beginning of *De sensu* 6 in favour of the infinite divisibility *per accidens* of sensible qualities. More specifically, no *De sensu* commentator prior to Albert wanted to risk affirming that there is a root of the natural world which goes

It is exactly thanks to this fundamental feature that the notion of the *inchoatio formarum sensibilium*, differently from that of the *inchoatio* of substantial forms, can be used by Albert in order to provide a "corpuscularian" interpretation of the third meaning of potentially perceptible introduced by Aristotle in *De sensu* 6, 445b3-446a20. Even more than that, unless further occurrences of the expression are found in other passages of Albert's *corpus*, it seems possible to affirm that the concept has been devised by Albert specifically to be used in this context.

The interpretation of Albert's conception of the production and of the mereological structure of sensible qualities as "corpuscularian", at least at the level of the *ultima minima*, might come as a surprise and it might be met with resistence. Nevertheless, why should the *ultima minima* endowed with the *inchoatio* of the forms of sensible qualities not be thought of as corpuscles? This interpretation would also help to make sense of the way in which Albert frames his commentary on the issue of *minima sensibilia*. Indeed, as said from the outset, Albert frames the whole Aristotelian discussion of it as a direct confrontation with Leucippus' and Democritus' atomism. Why, then, not think that with his solution Albert is trying to propose a notion of *minima* that mediates between Aristotle and the atomists? After all, the *ultima minima* individuated by Albert (which, at least according to the model he proposed in the *Liber de generatione* presented in the previous chapter, the one more compatible with the account of Albert's *De sensu* commentary, should still be endowed with their substantial forms, although being completely unable to act on the external environment) still possess the principle of the forms of sensible qualities, so that Albert can argue, against the atomists, that sensible qualities are not a mere appearance of the sense. On the other hand, however, he can also take full advantage of the "corpuscularian" remark made by Aristotle at *De sensu* 6, 446a10-15, by proposing an account of the production and of the mereological structure of sensible qualities that,

beyond the sensible one, since everything which is non-sensible, in the Aristotelian worldview, has to be intelligible, and this affirmation would have therefore entertained the unacceptable consequence of affirming that the sensible world is ultimately made of intelligible "building blocks". Albert, however, seems to be trying to propose a third view, one which would allow him to escape from the dilemma of previous commentators. The notion of the *inchoatio formarum sensibilium*, in this sense, seems to allow to identify an ontological level of reality that is intermediary between the sensible and the intelligible ones, and to which the ultimate "building blocks" of the sensible world belong. Of course, strictly speaking, insofar as the forms of sensible qualities (to which their *inchoationes* are identical in essence) are, even though in an ontologically "reduced" form, present in the *ultima minima*, even this level of reality can ultimately be considered sensible. Yet, the fact that the forms of sensible qualities undergo an ontological change when moving from the level of the *ultima minima* to that of the material substances which are made of them seems to mark a clear boundary.

without making any recourse to atomism, rather remaining fully within the boundaries of Aristotelian hylomorphism, explains how sensible qualities are ultimately composed by "imperceptible" entities and can, therefore, be divided into them. What is more, the attempt to find a conciliation between Aristotelianism and atomism (of the Democritean mold) on the issue of *minima* is an aspect which, as I have shown in the previous chapter, features explicitly in Albert's *Liber de generatione*. There, however, Albert called 'atoms' the *minima naturalia secundum operationem*, although such entities were still divisible in smaller parts endowed with their substantial forms (and, supposedly, also of the forms of their sensible qualities). In his *De sensu* commentary, however, Albert seems to claim that the only true "atoms", at least for what concerns sensible qualities, are the *ultima minima*. Nevertheless, the *ultima minima*, as Albert characterises them, are "minimal extensions" of matter, where, therefore, matter itself is not further divisible in act. In this sense, *minima naturalia*, *minima sensibilia* and *minima* of matter come to coincide at the same level, that of the *ultima minima*, which becomes the only meaningful notion of *minima* admitted by Albert. These *minima* cannot be divided in act in any sense whatsoever. If this interpretation is correct, in the *Liber de sensu* Albert truly provides a "corpuscularian" model not only of sensible qualities, but of material substances more generally. True, Alexander (and, later, the Medieval Latin commentators influenced by him) with his insistence on the third meaning of 'potentially perceptible' provides a model that at least hints towards a "corpuscularian" understanding of the forms of sensible qualities and of their behaviour in hylomorphic compounds. Nevertheless, both for Alexander and for the "Alexandrinist" tradition (at least until ca. 1300 – the situation, as I will show in the next chapter, will change significantly starting from the end of the 13th century), all these theoretical developments were confined to the realm of conceptual possibility. Indeed, all these commentators maintained (following Aristotle) that, in the natural world, the forms of sensible qualities united with extremely small portions of matter existing separately from the whole to which they belong would have been immediately corrupted by the action of the containing medium. By removing the action of the medium from the picture, Albert seems to mark a qualitative change in a "corpuscularian" direction. His model is intended to be a description of the *actual* behaviour of the forms of sensible qualities when united with extremely small portions of matter existing in isolation.

Here, however, I must urge the highest caution. Indeed, as I have noted in the previous chapter, the corrupting action of the containing medium is an aspect that Albert explicitly acknowledges in his discussion of *minima naturalia* in his *Physics* commentary, although it seems to disappear from the *Liber de generatione*. Given that the *Physics* commentary should have been composed by Albert before both the *Liber de generatione* and the *De sensu* commentary, however, and given that the two latter works present a doctrine of *minima* (*naturalia* and *sensibilia*, respectively) that is incompatible with the doctrine of *minima naturalia* presented in the *Physics* commentary, or that, in any case, marks a significant departure from it, it might at least be suggested, as a hypothesis, that Albert progressively evolved his conception of *minima* towards a more "corpuscularian" understanding, although, unfortunately, he never articulated it in a detailed fashion. How (if at all) such understanding was explicitly recognised by *De sensu* commentators writing after Albert, is an aspect that will be made clear throughout the rest of this chapter and, especially, in the next one.

3.6.2. Albert the Great on *Minima sensibilia*: A Summary

Albert's discussion of *minima sensibilia* is one of the most original ones among 13th-century commentators. The defining structural aspect of his analysis is the fact that he takes the whole issue of *minima sensibilia* to originate from an objection raised by a Democritean atomist against Aristotle's hylomorphic account of sensible qualities. In this sense, this discussion becomes for Albert an important opportunity to settle the score with atomism. He had already tried to do so in his earlier *Liber de generatione*, as I have shown in the previous chapter. Yet, in the *De sensu* commentary this becomes an even more urgent need, since, as Albert duly notes, the opposition between Aristotle and Democritus becomes radical when it comes to the metaphysics of sensible qualities. For Aristotle, they are accidental forms inhering in a hylomorphic compound, whereas, for Democritus, they are just a deceptive appearance of the senses originating from the position, order and shape of the atoms.

Albert's fundamental innovation in his discussion of *minima sensibilia* is that of developing a model of the production and of the mereological structure of the sensible qualities capable of engendering sensations in the external senses that mediates between Aristotle's and Democritus' conception. To do so, Albert makes two fundamental

conceptual moves. The first one is to leave completely out of the picture the corrupting action of the containing medium (thanks to a textual variant present in the *translatio vetus* of the *De sensu*). This allows him to be able to talk of portions of material substances (and of their sensible qualities) of any size whatsoever, even (potentially) infinitely small, as capable of independent existence (and this also disqualifies the entire distinction between "extrinsic" and "intrinsic" *minima sensibilia*). The second fundamental conceptual move is to bring into play a metaphysical notion that, while closely resembling a very important concept of Albert's metaphysics and natural philosophy, is actually different from it. This is what Albert calls the *inchoatio formarum sensibilium* (a concept apparently devised specifically in the context of the discussion of *minima sensibilia*). This notion refers to the fact that portions of matter too small to be perceptible in act, while not possessing the accidental form of their sensible qualities, still possess the *inchoationes* of such forms, that is, a formal feature that is identical in essence with such forms, but different in *esse* (i.e., having an "incomplete" *esse* when compared with that of the corresponding forms). Differently from the *inchoationes* of substantial forms, however, which are ubiquitous in Albert's metaphysics and natural philosophy, the *inchoationes* of the accidental forms of sensible qualities mentioned in the commentary on *De sensu* 6 are not transformed into the corresponding forms thanks to the action of an external causal agent already possessing these forms in their "complete" being. Rather, they are transformed into the corresponding forms of sensible qualities by uniting with a sufficient quantity of matter endowed with the *inchoationes* of these same forms.

Thanks to these two conceptual moves, Albert is able to propose one of the boldest (and also chronologically the first) "corpuscularian" model of the production and of the mereological structure of sensible qualities within Scholastic Aristotelianism. This model can be resumed as follows. Sensible qualities can be divided, through the division of the matter to which they are united, until a "minimal extension" of matter, what Albert calls the *ultima minima*. Such *ultima minima*, differently from any portion of matter greater than them, cannot be perceived in act, i.e., they cannot engender a sensation in the external senses. Thus, they do not possess the accidental forms of their sensible qualities (although they still possess they substantial forms). What they do possess are, intead, the *inchoationes* of the accidental forms of their sensible qualities. As such, when these ultima minima are united with a sufficient quantity of matter endowed with the

inchoationes of the same accidental forms of sensible qualities, together they give rise to entities endowed with the accidental forms of these same sensible qualities and, therefore, perceptible in act. In this way, as Democritus believed, it is true that the ultimate components of the sensible qualities we perceive are not perceptible on their own. Moreover, in agreement with Democritus, it is also true that there is an ontological difference between the ultimate components of sensible qualities and sensible qualities themselves. Still it is not the case, *contra* Democritus, that sensible qualities are merely deceptive appearances of the senses. On the contrary, they represent the perfect and complete ontological state of the forms that are only present in an imperfect state in their ultimate components. In this way, while remaining fully within the limits of Aristotle's hylomorphism, Albert is able to provide a "corpuscularian" model of the production and of the mereological structure of sensible qualities that retains some of the most important insights of Democritean atomism. This model, interestingly, was developed by Albert without knowing Alexander's commentary on the *De sensu*, which will be used, instead, by the later commentator who will develop the only other "corpuscularian" model of the production and of the mereological structure of sensible qualities in the Medieval Latin debate on *minima sensibilia*, i.e., John of Jandun. Significantly, however, Jandun's model, as I will show in the next chapter, while on different bases, will also share with Albert's model the fundamental idea that there is a certain ontological dissimilarity (not the same one identified by Albert, however) between sensible qualities perceptible in act and their ultimate components.

3.7. Thomas Aquinas and Peter of Auvergne on *Minima sensibilia*: The *Minima sensibilia secundum formam*

3.7.1. Thomas Aquinas

Thomas Aquinas composed his commentary on the *De sensu* (*Sentencia libri de sensu et sensato*) most likely between 1268 and 1270 (and likely between 1268 and 1269), just after he completed his *Sentencia libri de anima*[734].

[734] On the dating of the commentary, cf. THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, ed. GAUTHIER, pp. 127*-128*. Gauthier convincingly demonstrates that the commentary should be dated after Aquinas completed Book

Therefore, when he was writing, he had at his disposal two instruments that the commentators who preceded him lacked. The first is William of Moerbeke's Latin translation of Alexander's commentary on the *De sensu*, that in all likelihood (according to Gauthier's opinion) can be dated to May-August 1260. Secondly, Aquinas also possessed the revision, made by Moerbeke himself, of the *translatio vetus* of the *De sensu*, completed around 1265. More precisely, Aquinas' commentary is the first extant one in which we can be certain that these two texts are put to use: as I will show now, their impact is significant in the *Sentencia libri de sensu et sensato*[735].

Aquinas' commentary is in the form of a '*sentencia*', that is to say, a literal commentary that tries to elucidate the Aristotelian text by reconstructing the structure of the arguments of the Aristotelian text, rather than merely expounding them line by line. The peculiarity of Aquinas' commentary, but one which seems to have already been shared by Albert, is the fact that the *De sensu* and the *De memoria* are not intended as two separate treatises, but rather as two parts of a single treatise (the former dealing with external senses, the latter with internal ones) that provides a complement to Aristotle's psychology as presented in the *De anima*. While this aspect is significant in itself and for the history of the later reception of the *De sensu*, it has no specific impact on the debate concerning *minima sensibilia*, therefore I disregard it here (as I have done in Albert's case).

The first element to remark concerning Aquinas' discussion of *De sensu* 6, 445b3-446a20, is that, also due to the form of the commentary he adopts, he is extremely careful in trying to reconstruct the correct meaning of the Aristotelian text, also linking it with more general principles of Aristotelian philosophy. For instance, while presenting the arguments in favour of the infinite divisibility *per accidens* of sensible qualities,

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III of *the Summa contra Gentiles*, the *Prima pars* of the *Summa theologiae* and the *Sentencia libri de anima* (completed in Italy in 1265), while, at the same time, achieving it before the composition of the *De unitate intellectus contra Averroistas* (in 1270). These considerations, together with the observation that the manuscript tradition of the *Sentencia libri de sensu*, contrary to that of the *Sentencia libri de anima*, only stems from a Parisian university *exemplar*, convincingly situates the composition of the commentary early in Aquinas' second Parisian regency as *magister theologiae*, therefore between 1268 and 1270 and, in all likelihood, between 1268 and 1269.

[735] Regarding the influence of Alexander's commentary on Aquinas' one, the classical study is A. MANSION, *Le commentaire de Saint Thomas sur le* De sensu et sensato *d'Aristote. Utilisation d'Alexandre d'Aphrodise*, in *Mélanges Mandonnet. Études d'histoire littéraire et doctrinale du Moyen-Âge, Tome I, Bibliothèque thomiste Vol. XIII*, Paris, Vrin, 1930, pp. 83-102. The results of Mansion's study have been updated by Gauthier: cf. THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, ed. GAUTHIER, pp. 87*-111*.

specifically the second, "epistemological" one (according to which if sensible qualities were not infinitely divisible *per accidens*, then there would be portions of matter in nature which could not be cognised by the senses, and, since they could not be cognised, at the same time, by the intellect, since the intellect cognises what is outside of itself only through the senses, they could not be cognised at all), Aquinas remarks that here Aristotle is targeting Plato's ontological characterisation of forms as extramental realities[736].

Connectedly, Aquinas is also very careful in noting the connections between the text commented upon and other *loci* in the Aristotelian *corpus*. This is evident in the *Lectio* dealing with *De sensu* 6, 445b3-446a20 both in the fact that Aquinas identifies the source for Aristotle's refutation of the atomists' position in *Physics* VI and, when discussing the issue of the infinite divisibility *per se* of sensible qualities, he traces Aristotle's argument to his formulation in Book I of the *Posterior Analytics*.

Aquinas' interpretation of Aristotle's doctrine of *minima sensibilia* (as presented in the 15th chapter of his *Sentencia*) is based on a distinction between the solution *quantum ad ipsum sentire* and the solution *quantum ad ipsa sensibilia*[737]. This structural distinction, while not totally absent from the previous commentary tradition, seems to be an original development apported by Aquinas. With the reference to the solution *quantum ad ipsum sentire,* Aquinas refers to the portions of the Aristotelian text that corresponds to 445b29-446a10, where Aristotle introduces the distinction between the first and the second meaning of potentially perceptible mentioned above and the action of the corrupting medium on the sensible qualities of extremely small portions of matter when

[736] THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, tract. I, cap. 14, ed. GAUTHIER, p. 78, ll. 87-97: "Dicit autem hoc ad excludendum opinionem Platonis, qui posuit formas intellectas esse extra animam; secundum Aristotilem autem res intellecte sunt ipse nature rerum que sunt in singularibus, que quidem secundum quod in singularibus sunt cadunt sub apprehensione sensus, intellectus autem apprehendit huiusmodi naturas absolute et attribuit eis quasdam intentiones intelligiles (*sic!*), scilicet esse genus vel speciem; que quidem intentiones sunt, solum in intellectu, non autem exterius, unde solus intellectus ea cognoscit." Note that here, as in all following quotations from Aquinas' *Sentencia*, I have altered Gauthier's use of 'u' for both 'u' and 'v', so as to distinguish the two letters graphically. Note, moreover, that, although an English translation of Aquinas' *De sensu* (and *De memoria*) commentary has been published (THOMAS AQUINAS, *Commentaries on Aristotle* On Sense and What Is Sensed *and* On Memory and Recollection, K. White, E.M. Macierowski (trans.), Washington, DC, The Catholic University of America Press, 2005) all English translations from it are my own.

[737] THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, tract. I, cap. 14, ed. GAUTHIER, p. 78, ll. 153-160: "Deinde cum dicit: *Quoniam ergo passiones* etc., procedit ad solvendum principalem questionem, que erat de divisione sensibilium qualitatum. Et quia ad hanc questionem rationem assumpserat ex apparencia sensus, ideo primo inquirit de divisione in infinitum quantum ad ipsum sentire; secundo concludit propositum quantum ad ipsa sensibilia, ibi: *Cum autem itaque* etc."

existing in isolation. With the reference to the solution *quantum ad ipsa sensibilia*, instead, Aquinas refers to the crucial passage of 446a10-15, where Aristotle, in his thought experiment, introduces the third meaning of potentially perceptible. The fact that Aquinas considers the two parts of the Aristotelian text as presenting the same solution, only from different points of view, already shows that he is firmly committed to his belief in the internal consistency of the Aristotelian discussion. In order to save it, in the face of the apparently innovative and "disruptive" nature of Aristotle's remark at 446a10-15, Aquinas introduces an innovative interpretation, that, as I will show below, while preserving the hypothetical character of the passage, goes clearly against Alexander's understanding.

Before getting to this, however, Aquinas' interpretation of Aristotle's solution *quantum ad ipsum sentire* must be analysed. Aquinas, on the one hand, precisely restates Aristotle's doctrine concerning the distinction between the first meaning of potentially perceptible, insofar as all the parts of a sensible whole are perceptible by contributing to its perception in act[738], and the second meaning, according to which the parts of a sensible whole sufficiently great to be able to exist on their own once separated from it are potentially perceptible insofar as they would become perceptible in ct by being separated from it. On the other hand, however, when it comes to the case of the separation of smaller portions of matter from a sensible whole, Aquinas bases his interpretation of Aristotle's doctrine on the interpretation of *minima naturalia* he adopted in his commentary on

[738] Aquinas' only original addition in this respect is a polemical remark against an opinion attributed to some mathematicians (*quidam mathematici*) according to which we can perceive each part of a sensible whole while perceiving it: "Patet autem ex premissis falsum esse quod quidam mathematici dicunt, quod nichil simul totum videtur, set visus percurrit per partes visibilis, ac si videre sit continuum sicut et moveri. Decipiuntur autem in hoc, quia partes continui non sunt visibiles in actu, set solum in potencia, unde visus utitur toto visibili ut quodam uno indivisibili in suo genere, nisi forte utatur partibus non divisis ut divisis, sicut cum sigillatim inspicit unamquamque; set tamen nec hoc procedit usque ad quascunque minimas partes, quia sic sentire divideretur in infinitum, quod supra [i.e., in discussing Aristotle's argument against the infinite divisibility *per accidens* of sensible qualities] dimissum est pro inconvenienti" (THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, tract. I, cap. 14, ed. GAUTHIER, p. 79, ll. 191-203). As a side remark, it must also be noted that, thanks to the use of Moerbeke's *translatio nova*, Aquinas is also able to correctly interpret Aristotle's example of the line of one foot-length as potentially contained within the line of two foot-length as referring to the way in which the parts of a sensible whole are potentially sensible in it insofar as they contribute to its overall perception in act (cf. THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, ed. GAUTHIER, p. 79, ll. 185-190: "Et ita est *in aliis sensibilibus* quod ea que sunt *omnino parva* latent omnino sensum: sunt enim *visibilia* in *potencia, non autem* in *actu*, nisi *quando* separantur; sicut videmus in magnitudinibus quod linea unius pedis est in potencia in linea bipedali, set tunc est actu quando dividitur a toto").

Physics I.4, that is to say, that of *minima secundum formam*. This means that, in his commentary on *De sensu* 6, Aquinas reaffirms the fundamental metaphysical principle he had already stated in the commentary on the *Physics*, namely, that the substantial form determines the maximal and minimal quantity of matter in which it can subsist. In Aquinas' words:

> [Aristotle] says therefore first that, if the parts [of a material substance] exceeding in smallness (*in parvitate superhabundantes*) are separated from the whole [to which they belong], rationally it seems that they cannot remain because of the smallness of the preserving power (*virtutis conservantis*), because the power of the body is divided according to the division of magnitude, such as it appears in Book VII of the *Physics*, and therefore immediately those minimal [parts] separated [from the whole to which they belong] are converted in the containing body, e.g. air or water, such as it appears of a certain flavorous liquor that is poured into the sea[739].

Although Aquinas does not say explicitly, as he did in the *Physics* commentary, that the substantial form determines the maximal and minimal quantity of matter in which it can subsist, he clearly refers back to the same principle by his appeal to the preserving power (*virtus conservans*) of a material substance. Interestingly, however, Aquinas does not consider here explicitly whether also the accidental forms of sensible qualities determine the maximal and minimal quantity of matter within which they can subsist. The reason can be easily guessed: such a discussion would indeed be superfluous. Given that, below a certain quantity of matter, the substantial form of a material substance cannot subsist, with its corruption also the accidental forms of the sensible qualities associated with it will be corrupted, whereas, supposedly, insofar as the substantial form can persist, so too do the accidental forms of its sensible qualities.

Therefore, as already highlighted in the previous chapter, Aquinas' notion of *minima naturalia* (and *sensibilia*) is the strongest one which can be conceived. Not only Aquinas supports the existence of "intrinsic" *minima naturalia* (and *minima sensibilia*) in material substances. Rather, he clearly takes them to be determined *a priori* by the

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[739] THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, tract. I, cap. 14, ed. GAUTHIER, p. 79, ll. 209-217: "Dicit ergo primo quod, si partes in parvitate superhabundantes separantur a toto, *rationabiliter* videtur quod non possint permanere propter parvitatem virtutis conservantis, quia virtus corporalis dividitur secundum divisionem magnitudinis, ut patet in VII *Phisicorum*, et ideo statim illa minima separata convertuntur in corpus continens, puta aerem vel aquam, sicut patet de aliquo liquore saporoso qui infunditur *mari*."

substantial form of the material substance itself, regardless of the contingent condition of its existence within a material substance.

The obvious question that Aquinas has to face, in this perspective, is how to situate Aristotle's remark at 446a7-10 concerning the fact that the corruption of the sensible qualities of extremely small portions of matter, once separated from the whole to which they belong, is caused by the corrupting action of the containing medium. Indeed, on Aquinas' model, the action of the containing medium seems to be entirely superfluous and not causally related to the process of corruption of the substantial (and accidental) forms of extremely small portions of matter existing in isolation.

Aquinas' solution to this issue is of an undeniable elegance. In the last part of the passage quoted above, indeed, Aquinas claims that once extremely small portions of matter are separated from the whole to which they belong, they are corrupted due to the weakness of the preserving power of their substantial form, and, as a result, they immediately take on the substantial form (and the corresponding accidental ones) of the containing medium. In this way, the substantial change of extremely small portions of matter existing in isolation into the containing medium still takes place, but it is not anymore "extrinsically" caused by the corrupting action of the medium itself, rather, it is "intrinsically" caused by the weakness of the preserving power of the substantial form[740]. It is exactly the possibility of conceiving this second kind of corruption, different from the traditional Aristotelian one (which is always caused by the action of a contrary element onto the substance at hand) that Boethius of Dacia would strongly criticise, as seen in the previous chapter, resorting to an argument which, as I have shown above, features prominently already in Bacon's *Liber de sensu*.

The fact that Aquinas conceives his argument here to be closely linked to the one he developed in the commentary on *Physics* I.4 is proved by an explicit reference that he makes a few lines after the passage quoted above: "[…] hence it is to find a smallest flesh

[740] The same idea is restated in the passage that immediately follows the one quoted above: "Et ex hoc patet quare corpus mathematicum est divisibile in infinitum, in quo consideratur sola ratio quantitatis, in qua nichil est repugnans divisioni infinite; set corpus naturale, quod consideratur sub tota forma, non potest in infinitum dividi, quia, quando iam ad minimum deducitur, statim propter debilitatem virtutis convertitur in aliud" (THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, tract. I, cap. 14, ed. GAUTHIER, p. 79, l. 218-p. 80, l. 225). On the use of the notion of *corpus mathematicum* in the passage, see the considerations already put forth in Chapter 2 and those that will be put forth in Chapter 4 concerning Jandun's use of it.

(*minimam carnem*), such as it is said in *Physics* I [*Physics* I.4][741]." This is, moreover, another important piece of evidence that testifies (as seen also in Bacon's case) to the strong connection that Medieval Latin commentators perceived between the issue of *minima naturalia*, as especially linked with *Physics* I.4, and the one of *minima sensibilia*, discussed by Aristotle in *De sensu* 6.

After having discussed Aristotle's solution *quantum ad ipsum sentire*, Aquinas turns to the discussion of his solution *quantum ad ipsa sensibilia*, that is, he turns to the complex Aristotelian remark of 446a10-15. As I have said above, Aquinas' interpretation of the passage is highly original, and, what is more, it clearly shows, *e contrario*, that Aquinas had clearly present Alexander's solution while he was writing it. Indeed, evidently by reading Alexander (although, as I have shown above, this tendency was not altogether absent from Latin commentators unaware of Alexander's text, such as, most prominently, Albert the Great), Aquinas understood the momentuous "corpuscularian" implications that Aristotle's remark could suggest. Throughout all his Aristotelian commentaries, however, as I have shown in previous chapters, Aquinas displays (probably more than other commentators) a staunch opposition to any such model of explanation in natural philosophy.

In a sense, of course, the need to explain away the "corpuscularian" implications of Aristotle's remark at 446a10-15, is less pressing for Aquinas than for other commentators. Indeed, as I have just said, on Aquinas' model the sensible qualities of extremely small portions of matter existing in isolation are not corrupted by the action of the containing medium, rather, by the corruption of the substantial form of the matter itself. Therefore, Aristotle's thought experiment, that asks to consider what would happen to such extremely small portions of matter in the absence of the corrupting action of the containing medium, does not fundamentally modify Aquinas' framework, since the action of the medium does not play any direct causal role in it.

Still, Aquinas understood that Aristotle's thought experiment could be easily translated into a corresponding one which could be applied to his model of *minima secundum formam*, by considering what would happen to the sensible qualities of extremely small portions of matter existing in isolation if they could survive not only the

[741] THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, tract. I, cap. 14, ed. GAUTHIER, p. 80, ll. 225-226: "[...] unde est invenire minimam carnem, sicut dicitur in I *Phisicorum*."

"extrinsic" process of corruption due to the action of the medium, but also the "intrinsic" one due to the progressive weakening of the substantial form.

Even if one were to conceive such a thought experiment, however, Aquinas shows that the recourse to a "corpuscularian" explanatory model would not be required. The passage, for its importance to the thesis, needs to be quoted in full:

> Hence, even if sensible bodies were divided to infinity [i.e., if they were not corrupted neither by "extrinsic" nor by "intrinsic" processes], nevertheless it will not always be found an excess of sense (*superhabundancia sensus*) in the excellence of power corresponding to the very excess of the sensible in smallness, and this will not even be sensible, provided that the excessive smallness remains separate, because the excessive smallness of the sensible is in potency to be perceived by a surer and more perfect sense, and if such [a sense] is not there, it cannot be perceived in act. But, however, it will be sensible, for what is in itself: indeed, from [the fact] that it is separate, it already has the active power to modify the sense, and when a [sufficiently perfect] sense will come, it will be perceived in act. So, therefore, it appears that it is true what [Aristotle] said above [, that is,] that no magnitude is invisible, i.e. [no magnitude is invisible] for what is in itself, even though some is invisible due to the weakness of sight[742].

Aquinas' explanation of what would happen to the sensible qualities of extremely small portions of matter existing in isolation in the absence of any process of corruption is based on the analogy between the excess of the sensory power that would be required to perceive them and the excess of their smallness. As seen, Aristotle believed that, insofar as sensory powers cannot be divided, even *per accidens*, the only way for the sensible qualities of extremely small portions of matter to become perceptible in act was to unite with other portions of matter so as to become part of a greater whole, possessing the power of acting on the senses so as to engender a sensation. It is exactly this line of reasoning that Alexander exploits to develop his own "corpuscularian" understanding of the third meaning of potentially perceptible. Aquinas' explanation, instead, of how the sensible qualities of such extremely small portions of matter existing in isolation could

[742] THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, tract. I, cap. 14, ed. GAUTHIER, p. 80, ll. 239-254: "Unde, etiam si corpora sensibilia in infinitum dividerentur, tamen non semper inveniretur *superhabundancia sensus* in excellencia virtutis *secundum ipsam* superhabundanciam *sensibilis* in parvitate, nec etiam hoc esset superhabundanti parvitate sensibilis *separata* remanente, quia superhabundans parvitas sensibilis *inest* in *potencia* ut senciatur a *certiori* et perfectiori sensu, qui si non assit, non poterit *actu sentiri. Set tamen erit sensibile*, quantum est in se: *iam enim*, ex quo separatum est, habet potenciam activam ad inmutandum sensum, et quando sensus adveniet, sencietur in actu. Sic igitur patet verum esse quod supra dixit nullam magnitudinem esse invisibilem, scilicet quantum est in se, quamvis aliqua sit invisibilis propter defectum visus."

become perceptible in act exploits the notion of the excess of the sensory power in order to provide a conceptual model that is the exact reverse of Aristotle's (and even more of Alexander's) one.

Indeed, while Aristotle focuses on the quantity of the sensible required to make the sensible qualities at stake perceptible in act, Aquinas focuses on the "quantity" of the sensory power required for achieving the same result. To put it in other words, assuming (as Aquinas wants to do) that the quantity of matter to which the sensible qualities at stake are associated does not vary, the only way to make the sensible qualities perceptible in act again is to assume that they could be perceived by a sensory power sufficiently strong so as to perceive them. Such a sensory power should need to be much stronger than the human one, and, at the limit, (potentially) infinitely strong. Yet, once the thought experiment has assumed that sensible qualities are indeed (potentially) infinitely divisible in actuality, the infinite has already been introduced, and, so Aquinas seems to reason, there is therefore no problem to assume that, in this case, one could conceive a sensory power of (potentially) infinite strength. It is exactly the presence of this sensory power that could make the sensible qualities associated with extremely small portions of matter existing in isolation not only potentially perceptible, but perceivable (and perceived) in act.

Aquinas' reasoning, interpreted in this way, has one very important consequence for the history that I am retracing throughout this chapter. Indeed, Aquinas appears to be the first of the commentators I have analysed throughout the chapter to affirm the universal validity of the principle of the coextension of the sensible world and of the perceptible one. To be precise, Aquinas' adherence to this principle is not only greater than those of previous commentators (which, as I have shown, always tried to delimit its validity in one way or another), but it is also greater than Aristotle's one. Indeed, as I have said, the very same remark at 446a10-15 already put in doubt the universal validity of the principle, if not in the actual world, at least in a possible one. On Aquinas' model, instead, it is not only the case that the sensible world and the perceptible one are coextensive in the actual world (assuming that the minimal quantity of matter determined by each substantial form is sufficiently great for the forms of its sensible qualities to be actually perceived), but even in a possible world where sensible qualities can exist in

(potentially) infinitely small portions of matter existing in isolation there must exist a sensory power capable of perceiving them[743].

3.7.2. Peter of Auvergne

How was Aquinas' model received by subsequent commentators? Probably due to the important criticisms it received already in the early 1270s, as seen in the previous chapter concerning Boethius of Dacia's *Physics* commentary, Aquinas' model did not enjoy a widespread support.

The only known commentator, at least in the 13th century, who adheres to it (although with some major *distinguo*) is Peter of Auvergne, who composed a question commentary on the *De sensu* (not, however, a literal one, as he did for most of the other known *Parva naturalia* – the *De somno et vigilia*, the *De longitudine et brevitate vitae*, the *De iuventute et senectute*, the *De respiratione et inspiratione*, the *De morte et vita* and, if it is included in the list of the *Parva naturalia*, also the *De motu animalium* -, or, at least, none such commentary is extant).

Peter of Auvergne's question commentary on the *De sensu* is preserved in a single manuscript witness, ms. Oxford, Merton College, 275 (H.3.6) (late 13th-early 14th century), ff. 209-217v (*olim* 205r-213r)[744], and it has been critically edited in 1986 by Kevin White in Volume II of his Ph.D. thesis[745]. It is very difficult to establish a precise date for the work, since, even though the work has in all likelihood been composed while Peter was teaching at the Faculty of Arts in Paris, Peter taught at the Faculty of Arts in Paris maybe since the late 1260s, and certainly since the early 1270s, until 1296, where he moved, as said, to teach at the Faculty of Theology. The manuscript tradition, evidently, is not of much help, since the work is preserved in a single manuscript witness (maybe the copy of a student's *reportatio*) which is likely posterior to Auvergne's period of teaching at the Faculty of Arts. The date suggested by the editor of the text, Kevin White, for the composition of Peter's commentary on the *De sensu* (and also for his other

[743] Of course, Aquinas is also committed to the principle of the coextension of the natural world and of the sensible one, but this is a feature in common with most other previous Medieval Latin commentators on *De sensu* 6.
[744] The manuscript has been refoliated recently, therefore White's edition refers to the old foliation.
[745] K. WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, 2 vols., Ph.D. thesis, Ottawa, University of Ottawa, 1986.

question commentaries on the *Parva naturalia*, namely, the commentary on the *De memoria* and that on the *De somno et vigilia*) is probably between 1279 and 1284 (and at most between 1274-1284)[746]. The *terminus post quem* is mostly determined by White basing himself on the observation, made by Edgar Hocedez[747], that the question commentaries probably have been written by Peter after he composed the continuations of Aquinas' commentaries on the *De caelo et mundo* and the *Politics*, and also after his literal commentaries, together with the observation that q. 38 of the *Quaestiones in De sensu* by Peter seems to constitute a direct response to q. 15 of Henry of Ghent's *Quodlibet IV*, dated between 1279 and 1280. The *terminus ante quem* is, instead, more problematic, since White mostly works on the assumption that, since Peter became a master in theology in 1296, since the duration of the theological course of studies should have been of 12 years, and since Peter was likely not teaching at the Faculty of Arts anymore while pursuing his theological studies, Peter should have stopped teaching at the Faculty of Arts in 1284.

Such a dating (and in any case one not earlier than the 1280s), as I will show below, might also be supported by the fact that Peter's discussion of *minima sensibilia* bears witness to a stage of the reception of Alexander of Aphrodisias' commentary which is already quite advanced, and which already foreshadows the theoretical developments of the late 13th- and early 14th-century *De sensu* commentaries coming from the Parisian Faculty of Arts. This might suggest a late date of composition of the commentary, somewhere in the 1280s or even in the early 1290s. Nevertheless, the lack of *De sensu* commentaries from the Parisian Faculty of Arts which can be safely dated to the 1270s and the 1280s makes it extremely difficult to determine when, exactly, Alexander's commentary was completely assimilated by the Parisian masters. Indeed, the commentaries from the Parisian Faculty of Arts whose date of composition should approximate Peter's own one (the commentary attributed to Radulphus Brito, the commentary preserved in ms. Vat. Lat. 2170, and the one preserved in ms. Vat. Lat. 3061) should all be dated not before 1290. Be that as it may, the significance of Auvergne's

[746] See especially WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, pp. xv-xvii. In a recent article, White basically reasserts the same dating, although enlarging it to 1274-1284 (cf. ID., "Albert the Great, Thomas Aquinas, and Peter of Auvergne on "Mutis et surdis" (*De sensu et sensato* 437a16-17)", *Micrologus* XXXI/bis, forthcoming).

[747] Cf. E. HOCEDEZ, "La vie et les œuvres de Pierre d'Auvergne", *Gregorianum* 14, 1933, pp. 3-36, p. 13.

commentary is certainly accrued by the fact that it represents a unique (at least at the current state of our knowledge) witness to the *De sensu* commentary tradition at the Parisian Faculty of Arts during the central decades of the second half of the 13th century.

Auvergne's commentary consists of 56 questions, which mostly follow the structure of Aquinas' *Sentencia*, although, as I will now show, in some cases they introduce innovative elements that were emerging in the debate at the Parisian Faculty of Arts after Aquinas' death. The questions explicitly dedicated to the issue of *minima sensibilia* are q. 49, *Utrum qualitas sensibilis dividatur in infinitum*, and q. 50, *Utrum sensus dividatur <in> infinitum* (although the gist of Peter's solution is anticipated in q. 24, *Utrum aliquis color sit invisibilis propter parvitatem*, and some important elements are also contained in q. 54, *Si aliquod totum sit sensibile per se et primo, utrum quaelibet pars eius sit sensibilis*). As it is already apparent from the titles of the two *quaestiones*, Auvergne's discussion of the issue of *minima sensibilia* tries to follow, in its structure, Aquinas' distinction between the issue of the infinite divisibility *per accidens* of sensible qualities *quantum ad ipsum sentire* and *quantum ad ipsa sensibilia* (although in reverse order).

The topic of q. 24, *Utrum aliquis color sit invisibilis propter parvitatem*, represents a rather idyosincratic feature of Auvergne's *De sensu* commentary (at least for the 13th century, although it will find a much more developed correspondence in John Buridan in the 14th century), one which, nevertheless, contributes to show the relevance that the topic of *minima sensibilia* has for him. Indeed, the main topic of the *quaestio*, which only tangentially discusses the Aristotelian *lemma* from which it takes its inspiration, namely, the issue of whether there could be some colour that is invisible due to its distance from the perceiving subject (something which Auvergne quickly liquidates by noting that what is invisible from a certain distance is visible from a closer one), is exactly the issue of the infinite divisibility *per accidens* of colours. Against this possibility, Auvergne introduces the argument that Aristotle presents at the beginning of *De sensu* 6, namely, the one according to which if sensible qualities were infinitely divisible *per accidens*, then one should also posit the existence (unacceptable in the Aristotelian worldview) of an infinite sensory power, since sensible qualities are defined by their ability to act on the external senses. In solving the *quaestio*, Peter inserts the following considerations:

> It must be understood that no colour is invisible because of its smallness, because every colour, if it is a colour, is visible from a certain distance and with a certain sight. If, infeed, there is a certain colour that is invisible from a certain great distance, it will be visible from a certain closer distance. And moreover, if there is some colour that is invisible from the sight of man, it will be visible with the sight of another animal, or viceversa. And the reason of this is because colour according to its nature is a power to move the medium and also sight, such as it appears from the definition of colour; colour is, indeed, a force that moves the transparent in actuality, [as it is said in] *De anima* Book II [*De anima*, II.7, 419a9-11]. Hence, if so, something which has the nature of colour is not called colour if not because it was born to move the medium and sight. Therefore I say that every colour is visible with a certain sight and from a certain distance; and if it is not visible from a certain distance and with a certain sight, it is not colour, since this is the definition of colour[748].

The passage could not provide a more explicit statement of Peter's adherence, following Aquinas, to the principle of the coextension of the sensible world and of the perceptible one. No sensible quality existing in nature, so Peter claims, can ever exist in act without being perceptible in act by a certain sensory power (which, and it is interesting that Peter states it explicitly, does not need to be that of the human external senses).

What happens, then, to the sensible qualities of extremely small portions of matter when they are separated from the whole to which they belong? Peter states it in his *responsio ad rationem*, and precisely in his reply to the Aristotelian argument that, if sensible qualities were infinitely divisible *per accidens*, one should also posit an infinite sensory power:

> To the arguments [*in oppositum*]. It is not necessary that the visual power is infinite, because colour, since it is something natural, is not divided in infinity, therefore if a coloured body is divided, it will be reached something so small that in a smaller quantity it will not be saved the nature of colour, such as Aristotle claims in this book below [*De sensu* 6, 446a7-10], so that, if it were divided, it would be transmuted in the nature of the containing [medium], such as a drop of wine poured into the sea is immediately converted in the nature of water. I therefore say that it is not [possible]

[748] PETRUS DE ALVERNIA, *Quaestiones super De sensu et sensato*, q. 24, in WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, p. 51, ll. 25-39: "Intelligendum quod nullus color est invisibilis propter sui parvitatem, quia omnis color, si sit color, visibilis est ex aliqua distantia et aliquo visu. Si enim sit color aliquis qui sit invisibilis ex aliqua magna distantia, ex alia distantia propinquiori erit visibilis. Et iterum, si sit aliquis color invisibilis a visu hominis, erit visibilis visu alterius animalis, vel e converso. Et ratio huius est quia color secundum suam naturam est motivus medii et etiam visus, sicut apparet ex definitione coloris; est enim color motivus lucidi secundum actum, secundum *De anima*. Unde, si sic, aliquid habens naturam coloris, illud non dicitur color nisi quia natum <est> movere medium et visum. Ideo dico quod omnis color est visibilis aliquo visu et ex aliqua distantia; et si non sit visibile ex aliqua distantia et aliquo visu, non est color, cum haec sit ratio coloris."

> to reach a certain colour invisible due to its smallness, and that the visual power will not be infinite, because it is not [possible] to divide colour in infinity[749].

Here Auvergne is clearly adopting the position that I have labelled of *minima secundum formam*. More precisely, he is making his solution to the issue of *minima sensibilia* dependent on the understanding of *minima naturalia* as *minima secundum formam*, and he is doing it (both by his reference to the preservation of the nature of colour and by the way in which he interprets Aristotle's remark concerning the corrupting action of the containing medium at 446a7-10), although his precise understanding of such a doctrine remains impossible to ascertain. It is only by turning to qq. 49 and 50, the two explicitly devoted to *De sensu* 6, 445b3-446a20, that Auvergne's full doctrine of *minima sensibilia* comes to light.

The two *quaestiones*, as said, are structured in accordance with Aquinas' distinction between the doctrine of *minima sensibilia quantum ad ipsum sentire* and *quantum ad ipsa sensibilia*. Q. 49, which is the most theoretically sustained of the two, discusses the doctrine of *minima sensibilia quantum ad ipsa sensibilia*. Here, after presenting the two arguments introduced by Aristotle at the beginning of *De sensu* 6 in favour of the idea that sensible qualities are infinitely divisible *per accidens* (together with a first argument merely noting that insofar as sensible qualities exist in a continuous entity, they must be infinitely divisible such as the continuous entity in which they exist)[750], Peter starts to present his solution by again referring to the weakening of the power of substantial forms in progressively smaller quantities of matter. Differently from what he stated in q. 24, however, and, therefore, also differently from Aquinas, Auvergne here interprets the power at hand not as the preserving power of the form itself, but, rather,

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[749] PETRUS DE ALVERNIA, *Quaestiones super De sensu et sensato*, q. 24, in WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, p. 51, l. 40-p. 52, l. 50: "Ad rationem. Non oportet quod virtus visiva sit infinita, quia color, cum sit aliquid naturale, non dividitur in infinitum, immo si dividatur corpus coloratum, erit devenire ad aliquid ita parvum quod in minori quantitate non salvaretur natura coloris, sicut vult Aristoteles in hoc libro inferius, ita quod si divideretur, transmutaretur in naturam continentis, sicut una gutta vini infusa mari statim convertitur in naturam aquae. Dico igitur quod non est accipere aliquem colorem invisibilem propter parvitatem, nec erit virtus visiva infinita, quia non est dividere colorem in infinitum."

[750] Not, however (apart from the icastic formulation *Oppositum dicit hic philosophus*, cf. PETRUS DE ALVERNIA, *Quaestiones super De sensu et sensato*, q. 49, in WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, p. 94, l. 21), Aristotle's argument against the infinite divisibility *per accidens* of sensible qualities, that Peter had already discussed in q. 24 and that will feature prominently in the subsequent discussion of q. 49, as I will show below.

as the power that opposes the corrupting action of the containing medium. As Peter puts it:

> The quality itself, however [contrary to matter as a quantitative entity], cannot be infinitely divided, thus its division stops at a certain *minimum*; because if it is divided [that] same sensible will be divided in something of such small power that that power will not be able to resist to the containing [medium], but it will be immediately converted in the containing [medium], such as the smallest taste poured into the sea, such as the letter says [cf. *De sensu* 6, 446a7-10]. A greater power, indeed, is in a greater body, and a smaller [power] in a smaller [body]. Hence insofar as a sensible body is made smaller and smaller, [its] power is weakened, and therefore at the end it will be reached something of such small power that it will not have the power to resist [to the corrupting action of the containing medium]. This is true[751].

This passage is rather unexpected, and it is obviously in tension with what Peter stated in q. 24. The reason for inserting it, I believe, lies in Peter's attempt to provide a doctrine of *minima sensibilia* that, while adhering to a certain understanding of *minima secundum formam*, is also in keeping with the criticisms formulated against it, most notably, by Boethius of Dacia. In this sense, Peter's strategy would be to claim that it is true that, in the actual world, any corruption whatsoever is caused by the action of the contrary agent (in this case, that of the containing medium), but, in a world without the corrupting action of the containing medium, the sensible qualities of an extremely small portion of a material substance could be corrupted by an entirely "intrinsic" process. But is this the strategy adopted by Peter? And, in case of a positive answer, is the "intrinsic" process of corruption of the forms of sensible qualities the same envisaged by Aquinas?

In order to find the answers to these questions, one has not to look far. Indeed, in the passage immediately following the one quoted, Auvergne considers the scenario under discussion, namely, he asks what would happen in the absence of the corrupting action of the containing medium. His answer is based on two arguments. The first one is the following:

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[751] PETRUS DE ALVERNIA, *Quaestiones super De sensu et sensato*, q. 49, in WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, p. 94, l. 26-p. 95, l. 37: "Ipsa tamen qualitas non potest dividi in infinitum, immo terminatur eius divisio ad aliquid minimum; quia si dividetur ipsum sensibile, dividetur in aliquid tam parvae virtutis quod illa virtus non poterit resistere continenti, sed statim convertetur in continens, sicut sapor minimus infusus mari, sicut dicit littera. Virtus enim maior est in maiori corpore, et minor in minori. Unde secundum quod corpus sensibile efficitur minus et minus, debilitatur virtus, et ideo tandem devenietur ad aliquid tam parvae virtutis quod non habebit virtutem resistendi. Istud verum est."

> It seems that it is in agreement with Aristotle's intention that the sensbile quality by itself is not infinitely divisible, even if there were no corrupting [external agent]. This appears so: these sensible qualities have a certain action, whence they are said to be sensible, because they <were> born to move the sense. If, therefore, a sensible body were infinitely divided by itself so that something smaller were reached, and [then something] smaller than that [first thing], and so on *in infinitum*, then any of them could be perceived; and therefore it would follow that the sense is infinte according to the excess of the power of discrimination (*secundum superhabundantiam discretionis*), because that sense exceeds in discrimination which can cognise (*comprehendere*) something smaller. And then it would follow that the sense would infinitely exceed in discimination, if <the qualities> were infinitely divisible[752].

Here Peter clearly endorses the idea that, even in the absence of the corrupting action of the containing medium, the accidental forms of sensible qualities would not be infinitely divisible *per accidens*. Peter's argument appears, however, to be based not on considerations regarding the weakening of the preserving power of the substantial form, as in Aquinas, but rather on the principle according to which the form of a sensible quality is defined by its ability to act on the corresponding external sense. More precisely, Peter retains one of the elements that were central to Aquinas' doctrine of *minima sensibilia*, and to which he also explicitly appealed in q. 24 of his commentary, namely, the principle of the coextension of the sensible world and of the perceptible one. This principle, however, plays in Peter an even greater role than it did in Aquinas, since he uses it as the key premiss (which is, therefore, not in need of any demonstration) in order to demonstrate that even in a possible world deprived of the corrupting action of the containing medium every sensible quality existing in act must also be perceptible in act. Indeed, if the accidental forms of the sensible qualities are defined by their ability to act on the external senses, and if the sensory powers of the external senses are finite, then also the divisibility *per accidens* of the forms of the sensible qualities must be finite, even in the absence of the corrupting action of the containing medium. The division *per*

[752] PETRUS DE ALVERNIA, *Quaestiones super De sensu et sensato*, q. 49, in WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, p. 95, ll. 41-53: "Videtur esse de intentione philosophi quod qualitas sensibilis secundum se non est divisibilis in infinitum, etiam si non esset corrumpens. Hoc apparet sic: istae qualitates sensibiles aliquam habent actionem, unde dicuntur esse sensibilia, quia nata <sunt> movere sensum. Si igitur secundum se divideretur in infinitum sensibile ita quod esset accipere aliquid minus, et illo minus, et sic in infinitum, tunc unumquodque illorum posset sentiri; et tunc sequeretur quod sensus esset infinitus secundum superabundantiam discretionis, quia sensus ille superabundat in discretione qui potest comprehendere aliquid minus. Et tunc sequeretur quod superabundaret sensus in infinitum discretione, si <qualitas> esset divisibilis in infinitum."

accidens of the accidental forms of sensible qualities has to stop, in this case, at the threshold of perceptibility in act of these same forms.

Peter, however, does not content himself with this formulation. Rather, he goes on to present a second argument going in the same direction, but further specifying what he stated in the first one:

> Again. A sensible quality has [its] action from matter and it does not act in the sense if not through the medium. Indeed, its [proper] action is to move the sense. The medium, however, is determined in rarity and density, such as water or air; a medium indeed of this kind was not born to be moved by anything under whatever quantity, but only under a determined [quantity], since it is of determined rarity and density. And the other are called sensible because they <were> born to move the sense, and they cannot move [it] if not under a determined quantity. For this reason they are not infinitely divisible. Hence the action makes the form known, according to Averroes, and the action is not from whatever quantity, but, under a determined quantity. Hence, since they [i.e., sensible entities] have a determined quality, [they] also [have] a [determined] quantity; natural entities have a limit of their quantity both with respect to the *maximum* and with respect to the *minimum*[753].

The argument could not be clearer: since, indeed, sensible qualities are defined by their ability to act on the senses (as Aristotle stated in the argument against the infinite divisibility *per accidens* of sensible qualities at the beginning of *De sensu* 6), and as he (following Aquinas) firmly believes, in the absence of the corrupting action of the containing medium sensible qualities would not be divided in act below the threshold of perceptibility in act; rather, they would determine the (maximal and) minimal quantity of matter with which they can be associated. This quantity, however, is not defined by the quantity required by substantial forms in order to come to exist, or to persist in existence, in a given material substance, as it was in Aquinas. Instead, it is a quantity fully determined by the accidental forms of sensible qualities themselves[754]. Moreover, the

[753] PETRUS DE ALVERNIA, *Quaestiones super De sensu et sensato*, q. 49, in WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, p. 95, l. 54-p. 96, l. 67: "Item. Qualitas sensibilis a materia habet actionem et non agit in sensum nisi per medium. Actio autem sua est movere sensum. Medium autem determinatum est raritate et densitate, sicut aqua vel aer; huiusmodi autem medium non est natum moveri a quocumque sub quacumque quantitate, sed sub determinata, cum sit determinatae raritatis et densitatis. Et cetera dicuntur sensibilia quia nata <sunt> movere sensum, et non possunt movere nisi sub determinata quantitate. Quare non sunt divisibilia in infinitum. Unde actio facit scire formam secundum Averroem (*pro*: Averroes), et actio non est a qualibet quantitate, sed sub quantitate determinata. Unde cum habeant qualitatem determinatam, et etiam quantitatem; res naturales habent limitem suae quantitatis et ad maximum et ad minimum."

[754] Of course, if one assumes, on the one hand, that a substantial form cannot persist in existence without its inhering accidental ones, and that, on the other hand, its inhering accidental ones cannot persist in

quantity required by the accidental form of a sensible quality to be able to come to exist, or to persist in existence, in a given quantity of matter, is the quantity required by it in order to act on a medium of a certain density and to be perceived by the corresponding external sense, that is, the quantity required by it in order to perform its proper operation. In this sense, Peter's doctrine of *minima sensibilia* represents a fundamental *trait d'union* between Aquinas' doctrine of *minima secundum formam* and the later debate on *minima sensibilia* that would have been conducted at the Parisian Faculty of Arts (and not only) starting with the end of the 13th century, a debate centering exactly on the relation between the essence and the proper operation of a sensible quality.

The connection of Peter's doctrine with this later debate is reinforced by the fact that he makes use of one of the *auctoritates* that would have become current in this later debate. Indeed, in order to support his view, Peter makes reference to an *auctoritas*, taken from Averroes, according to which "the action makes the form known (*actio facit scire formam*)". The editor of Peter's commentary, Kevin White, has been unable to identify the passage to which Auvergne refers. Nevertheless, I believe that, with good probability, Peter has in mind the passage from Averroes' *Long Commentary* on *Metaphysics* H where Averroes, talking of the local motion of the celestial bodies, claims the following:

> Indeed, every motion in place is the body having a potency to the *ubi*; because, in the way in which substantial change makes us know that prime matter exists, so local motion makes us know that celestial bodies are [bodies] having a potency to the *ubi*.[755]

The argument therefore, in its original context, does not have anything to do with the idea that the performance of the proper operation makes us know the existence of the form that performs such operation. Instead, the argument is merely concerned with establishing a limited comparison between the way in which substantial change makes us know the

existence without it, then it follows from Peter's argument that the minimal quantity of matter determined by the accidental forms of the sensible qualities of a given material substance is also the minimal quantity of matter in which the substantial form of such material substance can exist. What is particularly interesting, in such an interpretation, is that, acccording to it, the *minima secundum formam* are primarily *minima sensibilia secundum formam*, and only secondarily *minima naturalia secundum formam*. If interpreted in this way, thus, Peter's model is the exact reverse of Aquinas' one.

[755] AVERROES CORDUBENSIS, *Aristotelis metaphysicorum libri XIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metaphysicorum liber*, Venetiis 1562, f. 220G: "Omne nam motum in locum est corpus habens potentiam in ubi; quoniam, quemadmodum transmutatio in substantia fecit nos scire materiam primam esse, ita transmutatio in loco fecit nos scire quod corpora coelestia sunt habentia potentias in ubi."

existence of prime matter, and the way in which local motion, as another kind of change, makes us know that the moving bodies have a potency to the *ubi*, that is, to a place different from the one where they were at the beginning of the motion itself.

Nevertheless, Averroes' argument was soon reformulated, in the Latin world, through a complex process whose steps cannot be retraced here, as establishing a comparison (not applying anymore, in a specific way, to the case of the celestial bodies) between the way in which substantial change makes us know the existence of prime matter, and the way in which the performance of its proper operation makes us know the existence of the form that performs such operation. A clear instance of the reformulation of Averroes' argument along these lines can be found in the *Auctoritates Aristotelis*, whose composition in its final form can be dated around 1295, but which certainly constitutes a work based on earlier *florilegia* circulating, notably, at the Parisian Faculty of Arts, and from which Peter could have easily taken the reference to Averroes' (reformulated) argument. Indeed, in the *Auctoritates Aristotelis* Averroes' argument is quoted, among the *auctoritates* from the *Long Commentary* on Book H of the *Metaphysics*, in the following way: "Such as substantial change makes [us] know [prime] matter, so the operation [makes us know] the form[756]."

In the reformulated version of the argument, a clear correspondence is established between the ability to know the existence of prime matter, based on substantial change, and the ability to know the form (primarily the substantial one, but nothing prevents enlarging it so as to apply as well to accidental forms such as those as sensible qualities, as Peter does in the passage quoted above), based on the performance, by such a form, of its proper operation. This "epistemological" argument will have a posterity in the Medieval Latin debate on *minima sensibilia*, since, as I will show in the next chapter, it will also be used by the anonymous author of the *De sensu* commentary preserved in ms. Oriel 33, where such an argument, however, will be combined (in an inferential relation) with the ontological one (which will have, comparatively, a greater importance in the Medieval Latin debate on *minima sensibilia*, from John of Jandun onwards) taken from Averroes' *Long Commentary* on *Metaphysics* Θ concerning the fact that, if one takes away the power of a form to perform its proper operation, one takes away its essence.

[756] *Auctoritates Aristotelis*, edited in J. HAMESSE (ed.), *Les* Auctoritates Aristotelis*: un florilège médiéval. Étude historique et édition critique*, Louvain-Paris, Publications Universitaires-Béatrice-Nauwelaerts, 1974, p. 133, n. 216: "Sicut transmutatio facit scire materiam, sic operatio formam."

Such an argument, however, as seen in the previous chapter, already featured in the debate on *minima naturalia* in the late 1260s-early 1270s at the Parisian Faculty of Arts, since it had been already quoted in the commentary on *Physics* I.4 by the Pseudo-Siger (although it should be noted that, even in light of the above, the identification of the Pseudo-Siger with Peter of Auvergne, at least for the relevant part of this *Physics* commentary, might not be too unlikely a hypothesis).

Although it is not possible to discuss the issue any further here, it seems clear enough that Peter appeals to the extremely strong (epistemological) connection that Averroes recognises between a form and its proper operation to claim that if sensible qualities were not able to perform their proper operation, that is, that of moving the sense, due to the smallness of the matter with which they are united, then it would not be possible to know them. In this way Peter exploits Averroes' argument in order to provide an original argument in favour of his doctrine of *minima sensibilia* (a foundation, moreover, which clearly shows, once again, Peter's belief in, and concern with, the principle of the coextension of the sensible world and of the perceptible one).

Peter's belief in the coextension of the sensible world and of the perceptible one is also at the center of q. 50, *Utrum sensus dividatur <in> infinitum*. Compared with q. 49, where Peter discussed the issue of *minima sensibilia quantum ad ipsa sensibilia*, his discussion of the issue *quantum ad ipsum sentire* in q. 50 is much shorter, and it does not add substantial elements to the doctrine of *minima sensibilia* detailed above. Nevertheless, Peter restates his belief in the coextension of the sensible world and of the perceptible one starting, this time, from the sensory powers, instead than from the accidental forms of sensible qualities, as he did in q. 49. In q. 50, indeed, he explicitly claims that, insofar as sensory powers are finite, so are the parts of a sensible material substance that can exist separately from the whole to which they belong (in the actual world, due to the corrupting action of the containing medium, and in a possible world without the corrupting action of the medium, due to the fact that the accidental forms of sensible qualities determine for themselves the minimal quantity of matter in which they can exist, which corresponds to the minimal quantity in which they can act on the external senses)[757]. On the contrary, all the parts of a sensible material substance are potentially

[757] PETRUS DE ALVERNIA, *Quaestiones super De sensu et sensato*, q. 50, in WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, p. 97, ll. 9-17: "Dicendum quod sensus non dividitur in

sensible in the first meaning, that is, insofar as they contribute to the overall perceptibility of the whole to which they belong. Peter also explicitly reaffirms Aquinas' belief in the idea that, normally, the external senses are only capable of perceiving the sensible qualities of a given material substance as wholes, but they can also focus on some parts of them as if they were separate from it (indeed, these parts should supposedly correspond to those that could exist in isolation from the whole to which they belong), not, however, on all of its parts (supposedly, not on those that, due to their smallness, would not be capable of existing in isolation from the whole to which they belong)[758].

Peter's discussion of the first meaning of potentially perceptible (together with some other aspects of his doctrine of *minima sensibilia*, most notably the reference to the corrupting action of the containing medium) is also restated, in very similar terms, in q. 54 of Peter's *De sensu* commentary, *Si aliquod totum sit sensibile per se et primo, utrum quaelibet pars eius sit sensibilis*, which is Peter's first question on the third *aporia* discussed by Aristotle at the end of the *De sensu*, namely, the one, discussed in *De sensu* 7, concerning whether it is possible to have more perceptions simultaneously. Here, the only innovative element to notice, when compared with Peter's previous discussion, is the fact that Peter provides a sort of "empirical" argument in favour of the idea that all the parts of a sensible whole contribute to the actual perception of the whole. The argument is that the perception caused by a given whole is stronger than the one that would be caused by the same whole if a part of it were removed[759]. The example that

infinitum, nec est infinitus, quia sensus est virtus existens in organo et quantitate determinata. Virtus autem quae est in quantitate determinata est finita, quia maior virtus in maiori corpore; ergo in finita quantitate, virtus finita. Unde sensibile natum est movere sensum, et non est sensibile divisibile in partes sensibiles separatas in infinitum. Partes enim a toto separatae sunt actu sensibilies, et totum non dividitur in tales partes in infinitum."

[758] PETRUS DE ALVERNIA, *Quaestiones super De sensu et sensato*, q. 50, in WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, p. 97, l. 17-p. 98, l. 27: "Partes autem quae sunt in toto sunt sensibilies non in actu, sed in potentia; sicut enim illae partes sunt in potentia in toto et non actu separatae, sic sunt potentia sensibiles. Unde sensus sentit aliquod totum simul, et non totum per partes. Verum est tamen quod aliquando contingit quod sensus sentit aliquam partem totius et non totum, et tunc intelligit illam partem ac si esset divisa a toto. Verumtamen sensus non potest sentire quamlibet partem continui hoc modo. Unde dicit littera: decimum millesimum milii latet visum, et diesis, idest minimum qui est in sono, latet auditum."

[759] PETRUS DE ALVERNIA, *Quaestiones super De sensu et sensato*, q. 54, in WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, p. 105, ll. 25-29: "Si autem partes intelligantur secundum quod sunt in toto, sic sunt sensibiles, quia quaelibet pars existens in toto facit ad hoc quod ipsum totum sentiatur. Cuius probatio est quia congregatio partium facit quod ipsum totum fortius moveat sensum quam si deficeret aliqua pars."

Peter seems to have in mind, since he uses it earlier in the same *quaestio*[760], is that of the sound produced by the fall of a heap of seeds (this example also features prominently in Walter Burley's commentaries on the *De sensu*, as I will show in the next chapter). Indeed, if one were to remove one of the seeds, the sound produced by their fall would be slightly weaker than the one produced by the previous heap. Of course, the example is inappropriate, insofar as a heap, by definition, is not a material substance, but it serves Peter's purpose better insofar as it provides a vivid illustration of his argument. A second, analogous consideration provided by Peter is that a given sensible whole can be seen from a greater distance when it does not lack any of its parts than when it does (here Peter links

[760] The example, however, is introduced by Peter as an argument in favour of the claim that if a sensible whole is perceptible in act, it does not follow that each of its parts is perceptible in act on its own. Thus, the original formulation of the example (which Peter takes from *Physics* VII.5, 250a20-25) is the one according to which whereas a heap of seeds falling to the ground causes a sound, a single one of them does not. Cf. PETRUS DE ALVERNIA, *Quaestiones super De sensu et sensato*, q. 54, in WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, p. 105, ll. 7-11: "Quod non [i.e., that if a whole is perceptible in act, each of its parts on its own is perceptible in act], probatio: quia dicit Philosophus septimo *Physicorum*: si aliquod totum habeat aliquam operationem, non oportet quod quaelibet pars habeat operationem illam; ut si tot grana faciunt sonum in aere, non oportet quod quodlibet per se faciat sonum." The example is remarkable in that, formulated in this way, seems to go explicitly against the idea that the threshold of perceptibility of material substances is inferior to (or the same as) that of their corruptibility, and, therefore, also against the principle of the coextension of the sensible world and of the perceptible one. Indeed, as I will show in the next chapter, Burley will rely on the example exactly to argue for this claim. On the contrary, Peter is forced to reconcile it with his belief that the threshold of perceptibility of material substances is inferior to (or the same as) that of corruptibility (although without providing a convincing interpretation of the example itself, and merely relying on a *petitio principii*). Cf. *ibid*., ll. 15-24: "Intelligendum quod partes alicuius totius possunt intelligi dupliciter: vel secundum quod sunt separatae a toto, vel secundum quod sunt in toto. Si igitur sit aliquid primo et per se sensibile, non oportet quod quaelibet pars eius divisa a toto sit sensibilis, sed erit devenire ad aliquam partem quae, si dividatur, convertetur in naturam continentis, secundum Philosophum superius. Sic intelligit Philosophus in septimo <*Physicorum*>, si tot grana faciunt sonum, etcetera, non oportet quod quaelibet pars divisa faciat sonum." Peter's solution, therefore, seems to be merely to claim that if there is a seed (or a portion thereof) so small that it cannot produce a sound on its own, such a seed (or portion thereof) must be immediately corrupted by the containing medium. True, the example is made particularly complex by focusing on the notoriously elusive case of sound. In particular, insofar as sound is frequently understood by Medieval commentators to be a sensible quality primarily associated with the medium itself, rather than with the substance producing it (on this aspect, see especially PASNAU, "Sensible Qualities. The Case of Sound", *op. cit.*), it might be claimed that this example does not threaten at all Peter's position, insofar as, in this case, no sensible quality is generated by the fall of the single seed, and, therefore, very simply there is no sensible quality at all which can be perceptible or imperceptible. Still, it seems rather clear (and it will become much more clear when I will discuss the use of the example made by Burley in the following chapter), that the example is taken here to show that an entity (a seed) which has the *nature* of something which can produce an auditory sensation, under the appropriate conditions, never does so. In this sense, and only from the point of view of hearing, a seed could be conceived as an "imperceptible" sensible entity and, in this specific sense, it could be taken to threaten the idea that the threshold of perceptibility of material substances is inferior to (or the same as) that of their corruptibility and, as a result, the principle of the coextension of the sensible world and of the perceptible one.

the issue of imperceptibility by smallness to that of imperceptibility by distance, as he had already done in q. 24)[761].

A final aspect must be remarked at this point. Indeed, Peter's doctrine of *minima sensibilia* shares with Aquinas' one another important aspect, namely, the absolute rejection of any "corpuscularian" interpretation of Aristotle's remark at 446a10-15. Like Aquinas, Peter does not give any space to such remark, and especially to the "corpuscularian" developments it had undergone in Alexander's commentary. More than that, thanks to the different form of his commentary, Peter is even able to avoid mentioning Aristotle's remark at all.

3.7.3. Thomas Aquinas and Peter of Auvergne on *Minima sensibilia*: A Summary

The doctrine of *minima sensibilia* developed by Aquinas, together with the one developed by Peter of Auvergne, provide a privileged point to explore the debate on *minima sensibilia* in the second half of the 13th century.

Aquinas' doctrine is fundamentally in line with the doctrine of *minima naturalia* he presented in his commentary on *Physics* I.4, which I have called the doctrine of *minima secundum formam*. According to this doctrine, insofar as substantial forms metaphysically determine the maximal and minimal quantity of matter in which they can come to exist, or persist in existence, these same quantities are also the maximal and minimal one in which the accidental forms of sensible qualities associated with their respective substantial forms can come to exist, or persist in existence. Aquinas' doctrine of *minima naturalia secundum formam* turns out to be as well a doctrine of *minima sensibilia secundum formam*. Aquinas' discussion of *minima sensibilia*, however, has to face at least an obstacle that Aquinas could have avoided in the context of commenting upon *Physics* I.4, namely, the need to make his own doctrine compatible with Aristotle's remark, at *De sensu* 6, 446a7-10, that extremely small portions of material substances separated from the whole to which they belong are immediately corrupted, together with their sensible qualities, by the corrupting action of the containing medium. Aquinas' way

[761] PETRUS DE ALVERNIA, *Quaestiones super De sensu et sensato*, q. 54, in WHITE, *Two Studies Related to St. Thomas's Commentary on Aristotle's* De sensu et sensato *together with an Edition of Peter of Auvergne's* Quaestiones super Parva naturalia, *op. cit.*, Vol. II, p. 105, l. 29-p. 106, l. 31: "Item, congregatio partium facit quod totum videtur ex maiori distantia quam si deficeret aliqua pars."

to square this remark with his own doctrine of *minima secundum formam* is to claim that the medium does not play any causal role in the corruption of extremely small portions of material substances and of their sensible qualities. Rather, portions of a material substance smaller than their *minimum naturale* (which, supposedly, is also the minimal quantity in which its sensible qualities are perceptible in act) lose their substantial and accidental forms due to the weakness of the preserving power of the subtantial form itself, and, *as a consequence of this process*, their matter immediately takes on the subtantial form (and the accidental forms of the sensible qualities) of the medium itself. In this way, Aquinas stands out as basically the only Medieval Latin *De sensu* commentator to deny the causal role of the corrupting action of the containing medium on extremely small portions of material substances and on their sensible qualities. Throughout his discussion of *minima sensibilia*, moreover, Aquinas' main overall concern remains that of affirming the belief that any sensible quality whatsoever existing on its own, be that in the actual or in a possible world, must be perceptible in act (this also brings Aquinas to provide an original interpretation of Aristotle's remark at 446a10-15, one based on the recourse to a potentially infinite sensory power).

It is this same belief that ground Peter of Auvergne's discussion of *minima sensibilia* in his own *De sensu* commentary. Peter's considered doctrine of *minima sensibilia*, nevertheless, is significantly different from Aquinas' own one, while clearly taking its starting point from it. First of all, Peter is clearly aware of the criticisms to Aquinas' doctrine of *minima secundum formam* put forth by Boethius of Dacia, and he is keen on admitting that, in the actual world, the corruption of extremely small portions of material substances, together with their sensible qualities, is caused by the corrupting action of the containing medium. Nevertheless, in a possible world deprived of the corrupting action of the containing medium, Peter believes that forms themselves would determine the (maximal and) minimal quantity of matter in which they can come to exist or persist in existence, so that, in any quantity smaller than it, their corruption would be due to an entirely "intrinsic" factor. Nevertheless, Peter, differently from Aquinas, believes that this quantity, for the accidental forms of sensible qualities, is not determined by substantial forms, but rather by these accidental forms themselves. Moreover, this quantity corresponds, according to Peter, to the minimal quantity in which the accidental form of a given sensible quality is able to perform its proper operation, i.e., that of acting

on the external senses so as to engender a sensation. Linking the determination *of minima sensibilia* to the quantity of matter required by sensible qualities in order for them to possess the power to perform their proper operation fundamentally links Peter's doctrine of *minima sensibilia* with the debate that would have started to take place at the Parisian Faculty of Arts (and not only) especially at the end of the 13th century (Peter also explicitly appeals to one of the *auctoritates*, taken from Averroes' *Long Commentary* on *Metaphysics* H, that would have been used in such a debate). Still, the reason for Peter to establish this strong connection seems to be ultimately derived from his willingness to defend the principle, at the centre, as well, of Aquinas' discussion of *minima sensibilia*, according to which any sensible quality existing on its own must be perceptible in act.

All in all, therefore, Peter's doctrine of *minima sensibilia* seems to be at the crossroads between an attempt to preserve the gist of Aquinas' solution (a strong notion of "intrinsic" *minima sensibilia*, combined with the absolute rejection of "corpuscularian" interpretations), the necessity to admit that, in the actual world, the only possible process of corruption of substantial forms (and, derivatively, of the accidental forms inhering in them) is due to the action of a contrary agent, and the effort, again following Aquinas, but going beyond him, to defend at all costs the principle of the coextension of the sensible world and of the perceptible one, an effort that brings Peter close to the later debate on *minima sensibilia*, where, paradoxically, this same principle will be rejected.

3.8. The English Debate on *Minima sensibilia* at the Turn of the Century

3.8.1. The Commentary of ms. Oxford, Merton College, 276, ff. 1r-8v (Walter Burley's First *De sensu* Question Commentary?): Developing the Dichotomy *Virtute*/*Actione*

Unfortunately, it is very difficult to follow the evolution of the English commentary tradition on the issue of *minima sensibilia*, since we do not have any *De sensu* commentaries of probable English origin which can be dated with some probability to the central decades of the second half of the 13th century. There are, however, at least two commentaries of probable English origin that seem to belong to the last decades of the 13th century or to the first decades of the 14th century.

One of them is the anonymous question commentary (of probable Oxford origin) preserved in an early 14th-century manuscript of English origin, namely ms. Oxford, Merton College, 276 (H.2.8), ff. 1r-8v. This commentary has been unanimously taken by modern scholars to be anonymous and to be likely dated to the end of the 13th century or even to the beginning of the 14th century[762]. Nevertheless, I have recently discovered, together with Juhana Toivanen, that the commentary presents the same text as that of the *De sensu* commentary preserved in ms. London, British Museum, Add. 18630, ff. 54r-67v, where the commentary is explicitly attributed to Walter Burley[763]. It would certainly be premature to claim that this constitutes sufficient ground to attribute the commentary to Burley, before a thorough palaeographic and codicological study of the text of the commentary in the London manuscript has been carried out. Nevertheless, it is important to mention this hypothesis in this context. It goes without saying that, if the commentary really is by Burley, all the available evidence would point to an early dating of the commentary within his production, a dating to the period ca. 1300-ca. 1307, where Burley was a Fellow of Merton College at Oxford. This is suggested, first of all, by the fact that the only two extant manuscript witnesses of the commentary come from England (so that there is no evidence of a circulation of the commentary on the continent), and one is even preserved in Merton College itself. Moreover, however, and much more importantly for the present thesis, the discussion of *minima sensibilia* in the commentary shows to have strong links with the earlier 13th century Oxford discussion. This observation provides the key rationale behind the decision to discuss the commentary at this point of the thesis rather than together with the *De sensu* commentaries whose attribution to Burley has been accepted in secondary literature. These commentaries will be discussed in the next chapter. Remarkably, as I will show there, they present a rather different doctrine of

[762] For a list of the *quaestiones* contained in the commentary, see S. EBBESEN, C. THOMSEN THÖRNQVIST, V. DECAIX, "Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue", *Bulletin de philosophie médiévale* 57, 2015, pp. 59-115, pp. 80-81. Q. 4 of the commentary, *Utrum aliquis sermo sit naturalis homini*, has been edited in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 155-157 (Ebbesen remarks that the *quaestio* is very similar to the corresponding one by Peter of Auvergne, but, as I will show below, this is far less so for the issue of *minima sensibilia*, where the commentary of ms. Merton 276 shows to be rather closer to the early Oxford commentary tradition than to the Parisian one). Q. 15, instead, *Utrum sensus particularis possit sentire sensibilia contraria simul, ut visus album et nigrum*, has been edited in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 174-175.

[763] Cf. the *colophon* of the commentary on f. 67v: "Expliciunt questiones *De sensu et sensato* secundum Burle".

minima sensibilia from the doctrine presented in the commentary of ms. Merton 276. This further consideration highlights that, whatever the truth of the matter concerning the attribution of this commentary to Burley, it represents (differently from Burley's other *De sensu* commentaries) a typical product of the teaching at Merton College around the turn of the century (at least for what concerns the doctrine of *minima sensibilia* it presents). This provides additional ground, if any were needed, to discuss it at this point of the thesis.

The commentary of ms. Merton 276 discusses the issue of *minima sensibilia* in q. 13, *Utrum qualitates sensibiles sint divisibiles in infinitum*, contained in f. 7va-b. As already anticipated, this commentary seems to bear witness to the persistence in the Oxford debate on *minima sensibilia*, throughout the 13th century, of views dating back to the early phase of the reception of the *De sensu*, although it presents them fully in hylomorphic terms and with some important modifications which testify to the fact that it belongs to a later stage of the reception of Aristotle's natural philosophy in general, and of the sources of the debate on *minima sensibilia* more specifically.

The first important aspect to notice is that the author of the commentary of ms. Merton 276 clarifies that there exist in material substances "extrinsic" *minima sensibilia* according to the corruption of extremely small portions of matter by the containing medium. Nevertheless, the commentator immediately introduces a distinction between a *divisio realis* of material substances, in which the sensible qualities associated with extremely small portions of matter existing in isolation are corrupted by the containing medium, and a *divisio ymaginata*, corresponding to Aristotle's thought experiment in 446a10-15 (whose interpretation by the commentator is clearly helped by his knowledge of Alexander's commentary, testified by an explicit quotation he makes of it in the *quaestio* under discussion), in which one can consider what would happen in the absence of the corrupting action of the containing medium:

> Therefore, if a natural body is divided, finally it is reached a quantity [which is] not proportioned to its power, and therefore, assuming the existence of a contrary containing [medium], immediately it is corrupted in its nature, because smaller [portions of matter] are more easily corrupted, and therefore the real division (*divisio realis*) of a continuous [body] does not goes on to infinity, but only the division in imagination (*divisio ymaginata*), because it is not necessary to imagine a containing [medium] contrary and corrupting, and therefore it is well said that a continuous

> entity insofar as it is natural is not infinitely divisible, but [only] insofar as it is mathematical [i.e., insofar as it is a quantity][764].

The process of corruption described by the commentator seems to be largely in agreement with the understanding of it present in Peter of Auvergne's *De sensu* commentary, according to which the corruption of material substances (and of their sensible qualities) is caused by the action of the medium, to which substantial forms, in extremely small portions of matter (that the commentator calls *improportionales sue virtuti*), are no more capable of resisting.

Nevertheless, immediately before this passage the commentator inserts a very interesting remark that does not find any exact parallel, as fas as I know, in any other Latin *De sensu* commentary of the period ca. 1250-1350. The commentator, indeed, after having distinguished between the two kinds of division of matter recognised by Aristotle in the text of *De sensu* 6, namely, that in equal and that in unequal parts, and after having remarked that even though the division of matter in unequal parts goes on to infinity, the division of the accidental forms of the sensible qualities (and, although the commentator does not say it explicitly, evidently also of substantial forms) according to such division of matter does not go on to infinity, rather only until a determined minimal quantity, due, as it is stated a few lines later, to the corrupting action of the containing medium, notes the folllowing:

> Such as, indeed, natural entities have determined properties and passions, so [they] have determined quantities, hence one is the quantity below which <passions> cannot inhere in the human nature, and another is the quantity below which it is not found the nature of man[765].

[764] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 13, ms. Oxford, Merton College 276, f. 7vb: "Ideo si corpus naturale dividitur, tandem est devenire ad quantitatem improportionalem sue virtuti, et ideo continente existente contrario statim in naturam eius convertitur, quia minora facilius corrumpuntur et ideo divisio realis continui non procedit in infinitum, sed solum divisio ymaginata, quia non oportet ymaginari contrarium continens et corrumpens, et ideo bene dicitur quod continuum in quantum est naturale non est divisibile in infinitum, sed in quantum est mathematicum." Note that, although I quote the text according to ms. Merton 276, I have fully collationated it with the text of ms. London, British Museum, Add. 18630.
[765] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 13, ms. Oxford, Merton College 276, f. 7vb: "Sicud nam naturalia habent determinatas proprietates et passiones, sic habent determinatas quantitates, unde alia est quantitas ultra quem <passiones> non possunt inerire in natura humana, et alia est quantitas ultra quem non reperitur natura hominis."

A proper understanding of the passage is hindered by the fact thtat the commentator takes the example of man, which is usually considered by Medieval Latin commentators, as I have said, an unproblematic case, such as all other living beings, for *minima naturalia* (and, as a result, also for *minima sensibilia*), since all Medieval Latin commentators agreed that the dimensions of living beings are metaphysically determined both in smallness and in greatness (they have their own *minima*, and *maxima*, *secundum formam*, so to speak, where, however, the form is the soul). Here the commentator is probably influenced by the fact that he has just adduced, before the passage quoted, the *auctoritas* of *De anima* II.4, a passage that is quite frequently quoted in connection, especially, with discussions of *minima naturalia* (in inanimate homogeneous susbtances) but that, of course, is taken from a text that discusses the case of living beings.

Be that as it may, once this interpretative issue is clarified, and once, therefore, the passage is applied to the case of inanimate homogeneous substances, it becomes of the utmost interest for the present thesis. In it, indeed, the commentator distinguishes between the minimal quantity of matter in which the accidental forms of sensible qualities can exist (that supposedly corresponds to the minimal quantity of matter in which they can resist to the corrupting action of the contrary qualities of the containing medium) and the minimal quantity of matter in which the substantial form of the material substance under consideration can exist (that supposedly corresponds to the minimal quantity of matter in which it can resist to the corrupting action of the containing medium). The commentator states explicitly that the former quantity is different from the latter. Unfortunately, the text does not specify whether the author thinks that the minimal quantity of matter in which the accidental forms of sensible qualities can exist is greater or smaller than that in which the substantial form can, but it seems very likely that it should be considered as a greater one.

On this interpretation, the author of the commentary would therefore go against at least one of the principles almost invariably accepted in the previous debate on *minima sensibilia*, as seen above, namely, that according to which a substantial form cannot exist without its inhering accidents. The reason to do so is unclear, however, since this passage is not followed by any further elaboration on the topic. One thing that can be said, however, is that it certainly represents one of the very few instances (probably the only one) in the Medieval Latin debate on *minima sensibilia* where the accidental forms of

sensible qualities acquire such an ontological independence from their corresponding substantial ones that the debate on *minima sensibilia* becomes almost entirely autonomous from the one on *minima naturalia*.

As I have said, however, after discussing what happens in the actual world (the case of the *divisio realis*), the commentator goes on to discuss what could happen in a possible world where the containing medium does not exercise any corrupting action on any given material substance existing in it (the case of the *divisio ymaginata*). The author's position is immediately stated in very clear terms:

> Assuming, however, that the containing [medium] did not exercise a corrupting action, a continuous entity could be infinitely divided and similarly [its] sensible qualities, and it will be reached a certain sensible quality that cannot modify the sense due to its smallness. The defect, however, will not be on the part of the sensible, but on the part of the sense, because the visual power does not grow to infinity, and when a sensible that is visible is smaller, a much more penetrating sight is required to perceive it, and in a continuous there are some sensible qualities that cannot be perceived by sight due to [their] smallness[766].

The conception proposed by the author of the commentary is clear: in the absence of the corrupting action of the containing medium, the accidental forms of sensible qualities would be divided according to the (potentially) infinite division of matter, and there would also exist sensible qualities associated with portions of matter so small that they could not be perceived in act by the external senses. In this way, the principle of the coextension between the sensible world and the perceptible one is lost (while, evidently, the principle of the coextension of the natural world and of the sensible one is fully retained). Moreover, the commentator goes on to clarify that the impossibility to perceive such sensible qualities in act would not depend on sensible qualities themselves, but only on the limitations of the finite sensory powers. That is to say, sensible qualities, according to the model proposed, would remain always "active", regardless of the quantity of matter with which they are united. Nevertheless, they would not be able to be perceived by the

[766] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 13, ms. Oxford, Merton College 276, f. 7vb: "Ponendo tamen quod continens non esset corrumpens, continuum posset dividi in infinitum et qualitates sensibiles similiter, et esset devenire ad aliquam qualitatem sensibilem qui non posset immutare sensum propter sui parvitatem. Defectus tamen non erit (*ms.* foret (?)) ex parte sensibilis, sed ex parte sensus, quia virtus visiva non crescit in infinitum, et quanto sensibile quod est visibile est minus, tanto acutior visus requiritur ad id percipiendum, et alique qualitates sunt in continuo sensibiles qui propter parvitatem non possunt percipi a visu."

external senses below a certain threshold of smallness of the matter to which they are united. In this way, the model proposed by the author of the commentary of ms. Merton 276 seems to adhere, in its fundamental aspects, to Bacon's doctrine of *minima secundum sensum*. Nevertheless, as I have mentioned above, Bacon complicated this model by having recourse to the confusing notion of 'aptitude', by claiming that portions of matter too small to be perceptible in act could have been called sensible 'in aptitude' (therefore coming close to the third meaning of potentially perceptible, but without explicitly drawing the "corpuscularian" implications associated with it). The author of the commentary of ms. Merton 276 avoids having recourse to such a notion, but he tries to situate his conception with regard to the distinction between sensible qualities which are perceptible *actione* and those that are perceptible *virtute* and, in doing so, he provides a more consistent and bolder doctrine of *minima secundum sensum* than Bacon's one:

> And if, indeed, sight sees a millet [seed], it will not see, however, the ten-thousandth part of the millet [seed]. Hence even if sight focuses on a visible whole, similarly however [it will not focus] on any of its parts. Hence such small [parts] which are not perceived according to their being in the whole are called sensible by power (*virtute*) and not by action (*actione*). Indeed, they are called sensible by power because with other parts move the sense, and [they] are not sensible by action because by themselves do not move the sense. Then because, if they were <not> separated [they] would move the sense, thus [they] are sensible by power, but because nevertheless [they] do not move [the sense by themselves], thus [they] are not sensible by action[767].

The first thing to note in the passage is that the author of the commentary of ms. Merton 276 has recourse to the lexicon proper to the *translatio vetus*, that is, that of sensible *virtute* and *actione*. This is not, likely, due to the fact that he is using the text of this translation instead of that of the *translatio nova*, already completed by Moerbeke decades before the plausible date of composition of the commentary. Rather, it seems clear that the author attributes to this couple of concepts a specific theoretical function which is distinct from that of *potentia* and *actus*. The use of this conceptual couple with a different

[767] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 13, ms. Oxford, Merton College 276, f. 7vb: "Et si nam visus videat milium non videbit tamen decimam millesimam (*ms.* milesimam) partem milii. Unde et si figeat visus in totum visibile, similiter non tamen in quamlibet partem. Unde talia parva que secundum esse in toto non percipiuntur dicuntur sensibilia virtute et non actione. Dicuntur nam sensibilia virtute quia cum (*ms.* in) aliis partibus immutant sensum et non sunt sensibilia actione quia per se non immutant sensum. Tunc quia si essent separata <non> immutarent sensum, ideo sunt sensibilia virtute, sed quia mo<do> non immutant, ideo non sunt sensibilia actione."

theoretical function than that of the couple of *potentia* and *actus* seems to be here somehow indebted to the discussion of the two concepts provided in Aspall's *Physics* commentary, as analysed in the previous chapter[768], and, even more directly, to the (different) discussion conducted by previous Oxford *De sensu* commentators, such as Buckfield and his circle in the three *De sensu* commentaries attributed to Buckfield himself, as seen above. The commentary of ms. Merton 276, however, when compared with the ones by Buckfield and his circle, shows very clearly how the conceptual process that, a few decades earlier, was still *in fieri*, had already achieved its completion (probably also thanks to the mediation of Bacon's *De sensu* commentary, or of one holding an analogous position). Indeed, according to the author of the commentary of ms. Merton 276 (in keeping with his acceptance of the doctrine of *minima secundum sensum*) the accidental forms of sensible qualities are sensible *virtute* when they are united to portions of matter too small to be perceptible in act, so that, in this case, while they still act on the surrounding medium, they are not able to be perceived by the corresponding sense organ and by its sensory power, whereas they are sensible *actione* when they are united to portions of matter sufficient to be perceptible in act, that is, when they are able to achieve their proper operation and, therefore, to be perceived by the corresponding sense organ and by its sensory power. In Aspall's conception, both the sensibles *virtute* and the sensibles *actione* of the commentary of ms. Merton 276 would have been classified as sensibles *actione* (insofar as they are able to act on the external environment), although the action of sensibles *virtute* would have been called a mere *actio inclinans*, whereas the action of sensibles *actione* would have been called an *actio inclinans et consequens effectum*. This difference noted, it is interesting to note that the author of the commentary of ms. Merton 276 seems therefore to be conflating three elements: Buckfield's use of the notion of sensibles *virtute* and *actione*, Bacon's doctrine of *minima secundum sensum*, and the conceptual categories provided by Aspall in his *Physics* commentary.

Be that as it may, the last passage quoted also evidences an important element that clearly distinguishes the author of the commentary of ms. Merton 276 from Bacon, and also, more in general, from the previous known Oxford *De sensu* commentary tradition.

[768] A discussion which, it should never be forgotten, concerned the *actio in extrinsecus* of substantial forms, and not of the accidental forms of sensible qualities. Still, there seems to be no fundamental objection, in principle, in extending Aspall's discussion also to cover the case of the accidental forms of sensible qualities.

This is the reference to the fact that sensibles *virtute* would be able to act on the external senses if they were united with *aliis partibus*, that is, with a sufficient quantity of matter endowed with the same sensible qualities. This remark shows that the author interprets sensibles *virtute* as those that, in Aristotle's and especially Alexander's terminology, would have been potentially perceptible in the third meaning, that is, those sensible qualities united to portions of matter too small to be perceptible in act but that could have become perceptible in act by uniting with a sufficient quantity of matter. In this sense, the notion of *virtus* provides a much more adequate functional equivalent of that of potentially perceptible in the third meaning than Bacon's notion of aptitude. Moreover, contrary to this last notion, that of *virtus* adopted by the author of the commentary of ms. Merton 276 does not in any way contradict the idea that sensible qualities always remain "active". Their *actio* is, however, to come back to Aspall's terminology, a mere *actio inclinans* and not an *actio inclinans et consequens effectum*.

More than this, the author of the commentary of ms. Merton 276 also explicitly draws the "corpuscularian" implications of Aristotle's remark at 446a10-15, and, more in general, those associated with the third meaning of potentially perceptible, insofar as he claims that sensibles *virtute* would become able to be perceived by the external senses by uniting with other parts (which are as well, it goes without saying, sensible *virtute*). The reason to explicitly state the "corpuscularian" implications of the doctrine of *minima sensibilia* (although always confined to a possible world deprived of the corrupting action of the containing medium), implications that had remained fully implicit in Bacon's *Liber de sensu*, seems to be closely linked to the direct influence exercised by Alexander's commentary on the author of the commentary of ms. Merton 276. Indeed, as I have said above, the author certainly knew Alexander's commentary, since he quotes it explicitly in the *quaestio* under discussion. However, the explicit quotation only concerns the distinction between the division *per se* of sensible qualities (that the author calls *divisio formalis*) and their division *per accidens* (that the author calls *divisio quantitativa*)[769]. The fact that Alexander's commentary is only quoted with regard to a mere point of terminology and of taxonomy might seem to suggest that such a commentary did not exert

[769] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 13, ms. Oxford, Merton College 276, f. 7va: "Ad quod dicendum secundum Alexandrum, et est sententia per quod divisio duplex est, formalis et quantitativa." Cf. ALEXANDER APHRODISIENSIS, *In Aristotelis De sensu commentarium*, ed. WENDLAND, 113.9-25.

an important influence on the commentary of ms. Merton 276, concerning the issue of *minima sensibilia*. Yet, as I have just suggested, a much stronger influence of Alexander's commentary, although implicit, seems to be suggested by the "corpuscularian" remark mentioned above.

If this is so, then the commentary of ms. Merton 276 seems to be located at a critical juncture in the Medieval Latin debate on *minima sensibilia*. While, on the one hand, it is still fundamentally associated with the early Oxford commentary tradition dating back to Buckfield, Bacon and (slightly more recently) to Aspall, on the other hand it also belongs to a period where the assimilation of Alexander's commentary was already advanced.

3.8.2. The Anonymous Commentary of ms. Cambridge, Gonville and Caius College, 512 (543), ff. 158v-169r (John Felmingham?): A Strong Criticism of the Oxford Commentary Tradition on *Minima sensibilia*

Nevertheless, it is certainly not the case that the positions on *minima sensibilia* proper to the early Oxford commentary tradition were still predominantly present in the English commentary tradition of the end of the 13th century and of the beginning of the 14th century as a whole (at least on the basis of the commentaries dating to this period that have a probable English origin). More specifically, while such positions might have remained predominant at Oxford, the situation seems to be rather different at Cambridge (it is unfortunately impossible, lacking any *De sensu* commentary originating from Cambridge and dated to the central decades of the 13th century, or in any case before the turn of the century, to determine whether this doctrinal difference between the two Universities on this subject only originated at the turn of the century or was rather present since the earlier decades of the 13th century).

Indeed, while, as seen, the commentary of ms. Merton 276 still presents very close links to the tradition epitomised by the *De sensu* commentaries attributed to Buckfield, by Bacon's *Liber de sensu* and by Aspall's *Physics* commentary, the second commentary of probable English origin of the same period (very likely originating from Cambridge) shows not only a much higher degree of theoretical independence from them, but even the explicit attempt to correct the views presented by such previous (and contemporary)

Oxford commentators. This is the anonymous commentary preserved in ms. Cambridge, Gonville and Caius College, 512 (543), ff. 158v-169r, a manuscript of English origin dated between ca. 1310 and 1330, possibly to be attributed to John Felmingham, a Master of Arts who was active in Cambridge in the first decades of the 14th century. The attribution is based on the fact that the commentary is preceded, in the manuscript, by Felmingham's *Expositio* on the *Meteorologica*, and also by the fact that in the top margin of f. 167r, a hand different from the one who copied the text has written *felmingham*. Given the scarcity of evidence, nevertheless, the attribution is to be considered as absolutely tentative. The commentary, divided in nine chapters (the first one corresponding to a proem to the whole work) is a literal one, an *expositio*, more precisely, explaining Aristotle's text line by line. Nevertheless, the author of the commentary frequently inserts *dubia* regarding the text that take on the form of fully-structured *quaestiones*. In the case, especially, of the last three chapters of the commentary, each one of them corresponds to one of the three *aporiai* of *De sensu* 6-7, where each *aporia* is reformulated as a *dubium* on the Aristotelian text. As a result, the *dubium* corresponding to the *aporia* of *minima sensibilia*, *Utrum qualitates sensibiles dividantur in infinitum*, corresponds to chapter 7 of the commentary (ff. 165vb-166rab)[770].

The main aspect in which the commentary opposes the previous (and contemporary) Oxford commentary tradition on *minima sensibilia* (and on *minima tout court*) concerns the use of the distinction between *virtute* and *actione* with a meaning different from that of 'potentially perceptible' and 'actually perceptible' respectively, something that Felmingham (?) fully rejects. This is clear in the way in which the commentator presents Aristotle's overall doctrine of *minima sensibilia*, while discussing

[770] For a list of the *quaestiones* contained in the commentary, see S. EBBESEN, C. THOMSEN THÖRNQVIST, V. DECAIX, "Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue", *Bulletin de philosophie médiévale* 57, 2015, pp. 59-115, pp. 77-78. Note that, contrary to what claimed in the catalogue, the seventh chapter of the commentary ends on f. 166rb, and not on f. 167rb. Moreover, the numbering of the ff. of the commentary presents a discontinuity, since f. 164 is followed by f. 166. Q. 5 of the commentary (the third *dubium* of the second chapter), *Utrum omnes surdi a nativitate sunt muti*, has been edited in S. EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *Cahiers de l'Institut du Moyen-Âge Grec et Latin* 86, 2017, pp. 138-215, pp. 183-184. The last chapter of the commentary, instead, *Utrum plura sensibilia possunt simul sentiri ab eodem sensu*, corresponding to the *aporia* concerning simultaneous perception discussed by Aristotle in *De sensu* 7, has been edited in J. TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *Cahiers de l'Institut du Moyen-Âge grec et latin* 90, 2021, pp. 112-225, pp. 189-193.

what happens to sensible qualities in the case of the division of the matter to which they are united in unequal parts:

> In another way [sensible qualities] can be divided in parts of the same proportion, of different quantities, however, i.e., by dividing the whole first in two halves, and one half of these in another half, and so in one way [sensible qualities] go on to infinity, in another way not, because dividing [the whole] in this way in one way [sensible qualities] can be divided in actual parts which were born to exist on their own, and so [sensible qualities] do not go on to infinity, because these parts are called actual that were born to exist on their own and to exert [their] proper operation [while existing on their own] (*iste partes dicuntur actuales que nate sunt per es existere et exercere propriam operationem*), and these [parts] are finite in [a given sensible] whole, because "the act ends and terminates", and such parts are called by Aristotle here "parts *secundum actionem*". In another way [sensible qualities] can be divided in potential parts existing in [a whole, that] were not born to exist on their own, and according to such [parts sensible qualities] can be divided to infinity, because such parts are called <potential> that only in the whole have [their] being and contribute to the action of the whole, on their own, however, have neither [their] being nor [their] proper operations due to [their] smallness and the weakness of [their] power (*tales partes dicuntur <potentiales> que in toto solum habent esse et conferunt ad actionem totius, per se tamen non habent esse nec proprias operationes, propter parvitatem et debilitatem virtutis*), but immediately surrender to the containing [media] if they are divided from the whole [to which they belong]. Hence, thus, let us take the smallest sensible (*minimum sensibile*) that can be taken so that it can exist [on its own], and let [that smallest sensible] be [the smallest sensible] of this fire. That smallest sensible brought [as an example] (?) has an infinite number of parts existing in [it], because that smallest [sensible] is a quantity, and nevertheless these parts existing in [it] could not exist on their own if they were divided from the whole [to which they belong], but [they] would immediately surrender and would be converted in the nature of this [medium] that contains that smallest [sensible], i.e., air or water or something of such kind, assuming that the smallest fire is divided in something of such kind.[771]

[771] IOANNES FELMINGHAM (?), *Expositio in De sensu et sensato*, cap. 7, ms. Cambridge, Gonville and Caius College, 512 (543), f. 166ra: "Alio modo possunt dividi in partes eiusdem proportionis, diverse tamen quantitatis, scilicet dividendo primo totum in duas medietates, et unam medietatem istius in aliam medietatem, et sic uno modo procedunt in infinitum, alio modo non, quia uno modo sic dividendo possunt dividi in partes actuales natas per se existere, et sic non procedunt in infinitum, quia iste partes dicuntur actuales que nate sunt per se existere et exercere propriam operationem, et iste sunt finite in toto, quia actus finit et termi<n>at, et tales partes voca<n>tur a philosopho hic 'partes secundum actionem'. Alio modo possunt dividi in partes potentiales inexistentes non natas per se existere et secundum tales possunt dividi in infinitum, quia tales partes dicuntur <potentiales> que in toto solum habent esse et conferunt ad actionem totius, per se tamen non habent esse nec proprias operationes, propter parvitatem et debilitatem virtutis, sed statim cedunt in continentes si dividantur a toto. Unde ergo accipiatur minimum sensibile quod potest accipi ut per se existat, et sit istius ignis. Illud minimum adductum (?) habet partes inexistentes in infinitum, quia illud minimum est quantum, et tamen iste partes inexistentes non possunt per se existere si dividantur a toto, sed statim cedunt et convertuntur in naturam istius quod continet illud minimum, scilicet aer vel aqua vel aliquod tale, ponendo quod minimum ignis in aliquod tale dividatur."

The passage is extremely clear in its presentation of Aristotle's doctrine: the parts *secundum actionem* of a sensible whole are those that contribute to its actual perception and that, if they were separated from it, could become perceptible in act on their own (therefore, those that correspond to the second meaning of potentially perceptible). On the contrary, the potential parts of a sensible whole (what the commentator would later identify as the parts *in virtute*[772]) are those that can only be perceived by contributing to the actual perception of the whole to which they belong, but that, if they were separated from it, would immediately be corrupted by the containing medium (therefore, those that correspond only to the first meaning of potentially perceptible).

One striking aspect of the passage is the extremely tight link that the commentator establishes between the existence of the sensible qualities of the portions of matter of a given sensible whole and their ability to operate on the senses to the point of being perceived. In the case of the parts *secundum actionem*, he explicitly says that "these parts [i.e., the parts *secundum actionem* of a sensible whole] are called actual that were born to exist on their own and to exert [their] proper operation [while existing on their own] (*iste partes dicuntur actuales que nate sunt per es existere et exercere propriam operationem*)". On the contrary, talking of the potential parts of a sensible whole, he claims that "such parts [i.e., the potential parts of a sensible whole] are called <potential> that only in the whole have [their] being and contribute to the action of the whole, on their own, however, have neither [their] being nor [their] proper operations due to [their] smallness and the weakness of [their] power (*tales partes dicuntur <potentiales> que in toto solum habent esse et conferunt ad actionem totius, per se tamen non habent esse nec proprias operationes, propter parvitatem et debilitatem virtutis*)".

In both cases the actual existence of the parts concerned (and, therefore, of their sensible qualities) is inextricably linked to the ability of the sensible qualities to perform their proper operation, that is, to be perceived in act. This insistence seems to be directly aimed at those commentators, such as (partially) Buckfield, the anonymous author of the commentary of ms. Merton 276, and all those previous and contemporary Oxford commentators who talked of *minima* (*sensibilia*, in this case, but the remark could be easily extended to *minima naturalia*) *virtute* in the specific meaning detailed above and,

[772] Cf. IOANNES FELMINGHAM (?), *In de sensu et sensato*, cap. 7, ms. Cambridge, Gonville and Caius College, 512 (543), f. 166ra: "Similiter (sc. Aristoteles) vocat partes actuales partes per actionem, et partes potentiales partes in virtute."

even more, against notions such as the Baconian one of *aptitudo*. Only those sensible qualities that are able to exercise their proper operation (and therefore to be perceived in act, not merely to perform what Aspall would have called a mere *actio inclinans*) can exist in act on their own.

On this reading, therefore, the commentary not only shows a strong reaction against the previous and contemporary Oxford commentary tradition on the twin issues of *minima naturalia* and *sensibilia*, it also shows a strong commitment to the principle of the coextension of the sensible world and of the perceptible one, an aspect which could bring it closer to the tradition stemming from Thomas Aquinas and Peter of Auvergne, and strongly against the tradition influenced by Alexander's commentary. In this sense, it is significant to remark that the commentator repeatedly notes that the ability to resist to the corrupting action of the containing medium is what distinguishes the parts *secundum actionem* and the potential parts of a given sensible whole. To put it in other words, the commentator is explicit in affirming that the sensible qualities associated with portions of matter that can exist on their own, separately from the whole to which they belong, are exactly those that are able to be perceived in act: the threshold of resistance to the corruption by the containing medium of a given portion of matter existing on its own is the same as the threshold of perceptibility in act of its sensible qualities. Nevertheless, it must be remarked that nowhere in the chapter on *minima sensibilia* does the commentator state that forms (be they substantial or accidental) determine the minimal and maximal quantities of matter with which they can be associated[773]. Felmingham (?) does not admit anything like *minima* (*naturalia* or *sensibilia*) *secundum formam*.

All in all, thus, it seems that the most productive way to interpret Felmingham (?)'s doctrine of *minima sensibilia* is to situate it against the background of the previous and contemporary Oxford commentary tradition, whereas the possible influence of the previous or contemporary Parisian commentary tradition remains a marginal aspect in it.

An aspect that distinguishes, instead, the commentary from both the Oxford and the Parisian commentary tradition is the fact that the commentator does not even take into

[773] Another aspect that distinguishes Felmingham (?)'s approach from Aquinas' one is that the latter does not recognise that the corruption of the substantial form of an extremely small portion of matter (and therefore of its sensible qualities) is caused by the action of the containing medium, while the former clearly believes so.

consideration what would happen to the sensible qualities associated with extremely small portions of matter existing on their own in the absence of the corrupting action of the containing medium. The commentator, indeed, chooses to completely avoid discussing the Aristotelian remark at 446a10-15, and, as a result, he leaves completely aside the issue of the third meaning of potentially perceptible and its "corpuscularian" implications.

Instead, after summarising the main points of Aristotle's discussion in *De sensu* 6, 445b3-446a20, the commentator discusses a final objection that, in its structure, is closely reminiscent of the third objection to the denial of "intrinsic" *minima sensibilia* in Bacon's *Liber de sensu*:

> If it is said <that> these potential parts have the power to act, but this power is useless which cannot be brought into act, thus these potential parts can be actual and this distinction does not <stand>, it must be said that [the potential parts] can be actual in the whole, not however on their own, and therefore [they] cannot be called actual parts in a proper way, because [they] are not called potential because they can act on their own, but because they can contribute to the action of the whole of which they are <parts>, and therefore they are called only [parts] existing in [a whole], and actual parts [are called] parts existing [on their own][774].

The objection, as it was for Bacon, is based on the principle according to which it is unacceptable that a potency in nature can never be reduced to act. In Bacon the reply to this objection (that targeted the idea that, in the absence of the corrupting action of the containing medium, there could have been sensible qualities existing in act in extremely small portions of matter separate from the whole to which they belong, yet without being perceptible in act) was based on the comparison with the Porphirian properties of the fourth kind, such as risibility for man. In Felmingham (?), instead (where the objection targets the supposed inability to act of the sensible qualities associated with the portions of a given whole too small to be able to exist separately from it), the reply to the same objection is, again, an opportunity to reaffirm the strong belief that the commentator has

[774] IOANNES FELMINGHAM (?), *Expositio in De sensu et sensato*, cap. 7, ms. Cambridge, Gonville and Caius College, 512 (543), f. 166ra-b: "Si dicatur <quod> iste partes potentiales habent potentiam agendi, sed vana est ista potentia que non potest reduci ad actum, ergo iste partes potentiales possunt esse actuales et ista distinctio non <stat>, dicendum quod possunt esse actuales in toto, non tamen per se, et ideo non possunt vocari partes actuales proprie, quia non dicuntur potentiales |f. 166rb| quia possunt per se agere, sed quia possunt conferre ad actionem totius cuius sunt <partes>, et ideo dicuntur inexistentes solum, et partes actuales partes existentes [...]."

in the principle of the coextension of the sensible world and of the perceptible one. Indeed, the commentator takes the opportunity to make it clear that, given a sensible whole which is perceived in act, the sensible qualities associated with extremely small portions of that whole are not perceived in act, since the external senses could never distinguish them, but they still contribute to the overall perception in act of the whole to which they belong. This is already, the commentator remarks, a way for them to be perceived in act, although they could never be perceived in act (and, indeed, they could not even exist) separately from the whole to which they belong. In this way, the commentator stresses the fact that, insofar as the external senses always perceive the sensible qualities of a given material substance as wholes (as – significantly – Aquinas, among others, underlined), what I have called the first meaning of potentially perceptible (contributing to the perception of the whole) is *already a form of act*, although not with the same ontological (and epistemological) value of the act by which the whole under consideration is perceived.

3.8.3. The English Debate on *Minima sensibilia* at the Turn of the Century: A Summary

The analysis of the discussion of *minima sensibilia* by the only two known late 13th-century English *De sensu* commentaries is important for its wider implications.

The commentary preserved in ms. Oxford, Merton College, 276 (and in ms. London, BM, Add. 18630), whether or not it is a commentary by Walter Burley, is an important witness of the late 13th-century Oxford debate on *minima sensibilia*. Indeed, it brings together the idea that, in the actual world, sensible qualities associated with extremely small portions of material substances are corrupted by the action of the containing medium[775] with a set of ideas typical of the early Oxford *De sensu* commentary tradition.

[775] With the crucial specification that the minimal quantity of matter in which such sensible qualities can exist and, supposedly, resist to the corrupting action of the contrary qualities of the containing medium, is different and, presumably, superior to that in which their corresponding substantial form can exist and, supposedly, resist to the corrupting action of the contrary medium; an apparently original remark in the whole Medieval Latin debate on *minima sensibilia*.

Indeed, the author of the commentary argues that, in the absence of the corrupting action of the containing medium, there would be no *minima sensibilia* whatsoever in inanimate homogeneous substances (as well as there would be no *minima naturalia* whatsoever in these same substances). Rather, below a certain threshold of smallness, the sensible qualities associated with portions of such substances would become unable to engender a sensation in the senses. Nevertheless, they would remain "active" towards them, so that any limitation to the production of sensations would only be due to the weakness of sensory powers (thus ultimately supporting Bacon's position of *minima secundum sensum*). To develop his position, however, the author goes beyond Bacon and (recovering an element already present, *in nuce*, in the commentaries attributed to Buckfield) affirms that sensible qualities "active" towards the senses, yet incapable of engendering a sensation, are those that can be called sensible *virtute*, whereas those that are capable of engendering a sensation can be called sensible *actione*. The conceptual couple thus individuated serves the purpose of developing the distinction between what Aspall had called, in his *Physics* commentary, a mere *actio inclinans*, and an *actio inclinans et consequens effectum*.

More than this, the author of the commentary also adds a final element to the picture, presumably under the influence of Alexander's commentary (which is explicitly quoted by him), namely, the idea that (in a possible world without the corrupting action of the containing medium) sensible qualities that are united to portions of matter too small to be able to be perceived in act (i.e., that are sensible *virtute*) can become perceptible *actione* by uniting with a sufficient quantity of matter endowed with the same sensible quality, therefore explicitly drawing the "corpuscularian" implications of Aristotle's remark at 446a10-15, although falling short of developing a proper "corpuscularian" understanding of the production and of the mereological structure of sensible qualities.

The other *De sensu* commentary of English origin that can be dated to the end of the 13th century, namely, the commentary preserved in ms. Cambridge, Gonville and Caius 512/543, probably originating from the teaching taking place at Cambridge, is marked by a fundamental opposition to the previous and contemporary Oxford commentary tradition on *minima sensibilia*. Indeed, the author of the commentary (possibly, but not likely, identifiable with John Felmingham) presents a discussion of *minima sensibilia* that remains very close to Aristotle's solution, in clear opposition to the

deviant interpretations of the text that were being provided at Oxford. The culmination of this attitude by the author of the commentary is the explicit identification of parts of a sensible whole that are perceptible *secundum actionem* with those that are potentially perceptible in the second meaning, that is, that could become perceptible in act on their own if separated from the whole to which they belong, and, correlatively, the explicit identification of parts of a sensible whole that are perceptible *secundum virtutem* with those that are potentially perceptible in the first meaning, that is, that are only perceptible insofar as they contribute to the actual perception of the whole to which they belong, but that would be immediately corrupted by the containing medium if they were separated from the whole to which they belong. No deviant interpretations of sensible *virtute* and *actione* are, therefore, accepted by the author of the commentary: sensible *virtute* are sensible *potentia*, and sensible *actione* are sensible *actu*.

As a corollary, the author of the commentary is thus also able to affirm that any sensible quality existing on its own in the actual world is perceptible in act (a view strongly defended both by Aquinas and by Peter of Auvergne, although in different ways). Interestingly, however, the commentator also discusses a possible objection to this view (an objection partially resembling one addressed in Bacon's *De sensu* commentary), namely, the idea that if some parts of a sensible whole, namely, those that are only potentially perceptible in the first meaning, can never become perceptible in act on their own, their sensible qualities will exist without ever being able to perform their proper operation and therefore to fulfill their purpose. The reply of the commentator is, interestingly, that contributing to the actual perception of the whole to which they belong is a way for the sensible qualities of these extremely small portions of material substances to be, in a certain sense, actualised.

The author of the commentary, moreover, does not discuss at all what would happen in the absence of the corrupting action of the containing medium, and therefore not even the problematic Aristotelian remark of 446a10-15 (together with its "corpuscularian" implications).

All in all, therefore, the effort of the author of the commentary is remarkable in its attempt to assert the correct interpretation of Aristotle’s doctrine in the face of the “misunderstandings” of the previous (or even contemporary) Oxford commentary tradition. Yet, it seems clear that in the commentary, probably due to this exact reason,

the negative side is much stronger than the positive one, and, in order to provide as consistent as possible a synthesis of Aristotle's doctrine, the author leaves completely aside many problematic aspects (such as, most notably, the remark at 446a10-15). It is, however, exactly the discussion of such aspects (and especially of this passage) that, in the first decades of the 14th century, at least at the Parisian Faculty of Arts, would have allowed commentators to bring forward a new and radically innovative doctrine of *minima sensibilia* and of the ontology and epistemology of sensible qualities more generally. To the emergence and development of such doctrine I devote the following (and last) chapter of the thesis.

CHAPTER 4

The Medieval Latin Debate on the Problem of *Minima sensibilia* (ca. 1300- ca. 1350)

4.1. The Emergence of a New Doctrine of *Minima sensibilia* at the Parisian Faculty of Arts at the Turn of the Century: Sensible Qualities without the Power to Perform their Proper Operation

As I have said in the previous chapter, Peter of Auvergne's *De sensu* commentary is the only extant Parisian commentary which can be safely dated to the central decades of the second half of the 13th century, and, with good probability, to the 1280s. Thankfully, the textual situation, for what concerns the Parisian Faculty of Arts at least, is quite different for what concerns the following decades.

Indeed, there are at least three commentaries on the *De sensu* which can be very likely dated to the period between the last decade of the 13th century and the first one of the 14th century (and likely very close to 1300), and which are almost certainly a product of teaching at the Parisian Faculty of Arts:

- The first of them is the commentary preserved anonymously in ms. Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. E.I.252, ff. 207r-214v and also (anonymously and in an incomplete form) in ms. Leipzig, Universitätsbibliothek, 1150, ff. 126r-133v, as I have recently discovered. The commentary, however, can be attributed with a very high degree of probability to Radulphus Brito (I will therefore discuss the commentary as Brito's in what follows, without, of course, wanting to make any definitive claim concerning the attribution)[776].

[776] For what concerns the attribution of the commentary to Brito (taking in consideration only the Florentine manuscript), see especially I. COSTA, *Il commento di Radulfo Brito all'Etica Nicomachea: edizione critica del testo con uno studio critico, storico e dottrinale*, Ph.D. thesis, Université de Paris 4 Sorbonne-Università di Salerno, 2007, pp. 354-363. Juhana Toivanen (TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, p. 120) summarises the issue as follows: "The work lacks ascription but it is almost certainly written by Brito. Several commentaries in the same codex [i.e., the Florentine manuscript] are attributed to him, the style used in *Quaestiones De sensu* is similar to what we find in his authentic works, and there does not seem to be any doctrinal discrepancies that would call the attribution into question." A list of *quaestiones* of the whole commentary (based, again, exclusively on the Florentine manuscript) is provided in EBBESEN, THOMSEN

- The second of them is the commentary preserved anonymously in ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170, ff. 117r-131r, which, however, could be possibly attributed to a certain Peter of Flanders, about whom we have, unfortunately, no precise biographical information, and to whom the *Quaestiones* on the *De morte et vita* and the *De motu animalium* that immediately follow the *Quaestiones* on the *De sensu* in the manuscript are explicitly attributed[777].

- The third one is the commentary preserved anonymously in ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3061, ff. 145r-150r, and which is followed by anonymous *Quaestiones* on the *De memoria et reminiscentia*, the *De somno et vigilia*, and the *De motu animalium*[778].

All three commentaries show close similarities between each other, and this is the reason why they are discussed together in this section. First of all, they all present what

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THÖRNQVIST, DECAIX, "Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue", *op. cit.*, pp. 72-73. Q. 8 of the commentary, *Utrum surdi a nativitate sint muti*, has been edited (using only the Florentine manuscript) in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 161-164. Q. 25 of the commentary, *Utrum duo sensus possint simul et in eodem tempore sentire duo sensibilia*, has been edited (using only the Florentine manuscript) in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 176-180.

[777] A list of *quaestiones* of the whole commentary is provided in EBBESEN, THOMSEN THÖRNQVIST, DECAIX, "Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue", *op. cit.*, pp. 76-77. The proem, q. 1 (*Utrum de istis operationibus, puta sentire, memoria et huiusmodi possit esse scientia*), q. 2 (*Utrum de istis sit distincta scientia a scientia de anima*), and q. 3 (*Utrum ira et memoria sint in omnibus animalibus*) have been edited in S. EBBESEN, "Anonymus Vaticani 3061 and Anonymus Vaticani 2170 on Aristotle's *Parva Naturalia.* An Edition of Selected Questions", *Cahiers de l'Institut du Moyen-Âge Grec et Latin* 86, 2017, pp. 216-312, pp. 295-311. Q. 7 of the commentary, *Utrum surdus naturaliter sit mutus*, has been edited in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 170-174.

[778] A list of *quaestiones* of the whole commentary is provided in EBBESEN, THOMSEN THÖRNQVIST, DECAIX, "Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue", *op. cit.*, pp. 73-74. The proem, q. 1 (*Utrum de operationibus anime possit esse scientia*), q. 2 (*Utrum de sensu et sensato sit scientia*), and q. 3 (*Utrum ira et memoria insint omnibus animalibus*) of the commentary have been edited in EBBESEN, "Anonymus Vaticani 3061 and Anonymus Vaticani 2170 on Aristotle's *Parva Naturalia.* An Edition of Selected Questions", *op. cit.*, pp. 228-243. Qq. 7 and 8 of the commentary, *Utrum surdus sit naturaliter mutus* and *Utrum si aliquis ponitur in nemore a principio sue nativitatis debeat loqui idioma determinatum*, respectively, have been edited in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 164-170. Q. On the dating of the two Vatican commentaries, and on their relation with Brito's one, see EBBESEN, "Anonymus Vaticani 3061 and Anonymus Vaticani 2170 on Aristotle's *Parva Naturalia.* An Edition of Selected Questions", *op. cit.*, p. 223: "A date close to 1300 and a Parisian origin seem indicated for both texts [i.e., the *Quaestiones* on the *Parva naturalia* in ms. Vat. Lat. 2170 and those in ms. Vat. Lat. 3061], which combine similarities between them with each exhibiting many similarities with Radulphus Brito's questions on the *Parva naturalia*. Brito's Aristotle commentaries can be securely dated to the period between ca. 1290 and 1305. Anonymus Vaticani in qu. 1 on *De memoria* cites Thomas Aquinas as *Expositor*, which means that at the time of writing the latter's commentary on *De sensu* and *De memoria* had become the standard companion to Aristotle's work, and that is at least consistent with a date about 1300."

they (correctly) take to be Aristotle's doctrine of *minima sensibilia* as based on the fact that, while the sensible qualities existing within a continuous entity are (potentially) infinitely divisible, although only in imagination, according to the division of the continuous entity itself, and they are all sensible insofar as they contribute to the perception of the whole to which they belong (the first meaning of potentially perceptible), the sensible qualities of portions of matter separated from the whole to which they belong are not infinitely divisible, insofar as natural entities have *minima* and also insofar as the sensible qualities of extremely small portions of matter existing in isolation would be corrupted by the action of containing medium. Still, concerning Aristotle's problematic remark at 446a10-15 (the thought experiment regarding the actual existence of sensible qualities that are not perceptible in act), all three commentaries (although in various ways) testify, as I will show below, to a fundamental theoretical shift in the Medieval Latin debate on *minima sensibilia*, one which certainly corresponds to a progressive assimilation (and influence) of Alexander's commentary, but which at the same time goes well beyond it.

4.1.1. Radulphus Brito

Brito's commentary discusses the issue of *minima sensibilia* in q. 23, *Utrum passiones sensibiles sint divisibiles in infinitum*. One feature that immediately jumps to the eye by looking at Brito's discussion is the fact that it clearly shows a strong influence of Alexander's commentary. This is especially evident when looking at the way in which Brito solves the issue of the infinite divisibility *per se* of sensible qualities. Indeed, in order to demonstrate that sensible qualities are not infinitely divisible in species within genera, he not only adduces Aristotle's argument, but he adds a second argument that (although in a simplified form) is taken (as Brito explicitly acknowledges) from Alexander's commentary. The argument (that Brito is, to my knowledge, the first Medieval Latin commentator to quote) in the version presented in this commentary is the following: given that in any genus of sensible qualities the individuals in which such qualities are instantiated are by definition much more than the species, if the species of sensible qualities within that genus were infinite, then one would have to posit the existence of a quantity greater than the infinite. This, however, is an entirely unacceptable

conclusion, since, as Brito remarks, the infinite comprehends everything that exists (*infinitum totum comprehendit*)[779].

For what concerns, instead, the issue of *minima sensibilia* proper, Brito starts his discussion in a customary way, by introducing the two kinds of division of a continuous entity, that is, in equal and unequal parts. Interestingly, however, he connects the distinction between these two kinds of division with two ways in which sensible qualities can be accidentally divided, that is, in potency, insofar as they are considered as parts of a given whole (and therefore as being potentially perceptible in the first meaning), and in act, that is, by separating the portions of matter with which they are united from the whole to which they belong (and therefore as being potentially perceptible in the second meaning). While, Brito remarks, the first kind of accidental division of sensible qualities is (potentially) infinite, the second one is finite[780]. This passage is especially relevant insofar as, once again, it shows the strong influence of Alexander's commentary on

[779] Brito's full argument is the following one (note that all the quotations are from ms. Firenze, BNC, Conv. Soppr. E.I.252, although the text has been fully collationated with that of ms. Leipzig, Universitätsbibliothek, 1150): "Item hoc [i.e., that within each genus of sensible qualities there is a finite number of species] probatur ratione Alexandri, quia si dividerentur in infinitum tunc esset aliquod maius in infinito. Hoc est falsum, quia infinitum totum comprehendit. Probatio conclusionis (*ms.* conclusione), quia in genere qualitatum sensibilium individua sunt multo plura quam species. Ergo si species essent infinite, secundum hoc divisio formalis et specifica qualitatum sensibilium procederet in infinitum, <et> tunc individua que sunt plura speciebus essent plura infinito" (RADULPHUS BRITO, *Quaestiones super De sensu et sensato*, q. 23, ms. Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. E.I.252, f. 213rb). Note, incidentally, that the argument, in Brito's formulation (not, however, in Alexander's original one) seems to conflate two different notions of the infinite, namely, a mathematical one, according to which there could be no numerical quantity greater than the infinite, and a metaphysical one, according to which the infinite is a divine attribute, thus referring to God as including in Himself the whole creation. Be that as it may, the most important premiss of the argument is that there cannot be two unequal infinites. On the Medieval Latin debate on the issue, see especially MURDOCH, *Infinity and Continuity*, *op. cit.*, and, more recently, J.E. MURDOCH, *Beyond Aristotle: Indivisibles and Infinite Divisibility in the Later Middle Ages*, in C. GRELLARD, A. ROBERT (eds.), *Atomism in Late Medieval Philosophy and Theology (Medieval and Early Modern Philosophy and Science, vol. 9*), Leiden, Brill, 2009, pp. 15-38, esp. pp. 21-24. Note, however, that, contrary to what Murdoch claims, it is not true that the belief in the impossibility of the existence of unequal infinites, for Medieval Latin commentators, was not affirmed in any of the ancient sources they had at their disposal. This is indeed contradicted by the fact that Alexander's argument, which is based exactly on the belief in the impossibility of the existence of unequal infinites, was known and quoted by at least one Medieval Latin commentator, Brito (but, as I will show later in the chapter, the argument also features prominently in John of Jandun's *De sensu* commentary).

[780] RADULPHUS BRITO, *Quaestiones super De sensu et sensato*, q. 23, ms. Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. E.I.252, f. 213rb-va: "Hoc viso [i.e., that a continuous entity can be only finitely divided in equal parts, but (potentially) infinitely in unequal ones] dico quod qualitates sensibiles possunt dividi consimiliter uno modo ut sunt in corpore continuo, et sic sunt divisibiles in infinitum secundum divisionem continui in quo sunt, et hoc in potentia. Alio modo ut sunt in partibus continui actu divisis et separatis et |f. 213va| tunc dico quod non sunt divisibiles in infinitum."

Brito's one, since an analogous passage was, indeed, present in Alexander's commentary[781].

An aspect that is especially important to underline is that, when Brito has to explain why the parts of a sensible whole capable of existing in act with their own sensible qualities separated from the whole to which they belong are finite in number, he does not have immediate recourse to Aristotle's explanation, namely, to the fact that extremely small portions of matter, together with their sensible qualities, are corrupted by the action of the containing medium. Rather, before doing so, he inserts an important passage where he directly connects the issue of *minima sensibilia* to that of *minima naturalia* as discussed by Aristotle in *Physics* I.4, therefore providing additional evidence of what I have remarked multiple times, namely, that Medieval Latin commentators conceived of the two debates as inextricably linked. Brito's passage is the following one:

> The second [claim, i.e., that the parts of a sensible whole capable of existing in act with their own sensible qualities separated from the whole to which they belong are finite in number] is demonstrated because the division of that in which it is found a *maximum* and a *minimum* does not go on to infinity. However, in these parts separate from the whole [to which they belong] it is required to give that [i.e., a *maximum* and a *minimum*]; therefore etc. The major [premiss] is clear because there is nothing greater than the *maximum*, and nothing smaller than the *minimum*. The minor [premiss] is clear because these parts are certain natural entities; however, in natural entities there is a *maximum* and a *minimum*, such as it is said in *Physics* Book I [i.e., *Physics* I.4]; therefore etc.[782]

The passage quotes the *auctoritas* of *Physics* I.4 in support of the claim that no natural entity can be infinitely great or infinitely small, hence not even the portions of a sensible whole which exist separately from it. While the reference is not articulated further, it shows with sufficient evidence that the texts of *Physics* I.4 and of *De sensu* 6, by the end of the 13th century, had become so interconnected that *Physics* I.4 could be adduced to ground Aristotle's doctrine of *minima sensibilia* in *De sensu* 6, exactly in the same way as, as seen in Chapter 2 of the thesis, the text of *De sensu* 6 could be adduced (and was frequently adduced) to ground Medieval doctrines of *minima naturalia* based on the text

[781] Cf. ALEXANDER APHRODISIENSIS, *In Aristotelis De sensu commentarium*, ed. WENDLAND, 121.5-27.
[782] RADULPHUS BRITO, *Quaestiones super De sensu et sensato*, q. 23, ms. Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. E.I.252, f. 213va: "Secundum demonstratur quia divisio illius non procedit in infinitum in quo est reperire maximum et minimum. Modo in istis partibus separatis a toto illud dare requiritur (?); ideo etc. Maior patet quia maximo non est maius, neque minimo est minus. Minor patet quia iste partes sunt quedam entia naturalia; modo in entibus naturalibus est dare maximum et minimum, ut dicitur primo *Physicorum*; ideo etc."

of *Physics* I.4. Interestingly, Brito does not mention, in this context, the reason why one should admit the existence of "intrinsic" *minima naturalia* (and therefore of "intrinsic" *minima sensibilia*) in homogeneous material substances in this context. However, as I have shown in Chapter 2, he does deal with the issue at length in his own *Physics* commentary. There, his position appears to be that *minima naturalia* in homogeneous material substances (and possibly not only) correspond to the smallest quantity of matter in which a substantial form has the power to perform its proper operation (through the accidental forms of its primary qualities acting as instrumental causes). This same quantity, as Brito clearly states here, is also the minimal quantity of matter in which its own sensible qualities can exist, insofar as, in smaller ones, the loss of the substantial form of the matter itself necessarily brings with it also the loss of the accidental forms of its corresponding sensible qualities. Nevertheless, Brito also explicitly states that the corruption of substantial forms, in portions of matter smaller than the *minimum naturale*, depends on the corrupting action of the contrary medium, so that it becomes clear that the minimal quantity of matter in which a substantial form is able to perform its proper operation is also the minimal quantity of matter in which the same subtantial form is able to resist to the corrupting action of the containing medium.

The reference to the corrupting action of the containing medium features prominently also in Brito's *De sensu* commentary. Indeed, just after the passage quoted, Brito goes on to present the argument adduced by Aristotle in *De sensu* 6, 446a7-10 in support of the claim that the portions of a sensible whole existing separately from it cannot be infinitely small, that is exactly the one based on the consideration of the corrupting action of the containing medium:

> Moreover, that which, divided up to a certain quantity is immediately resolved in the containing [medium] is not infinitely divisible. However, the parts of a continuous entity divided [from it] are of this kind, as Aristotle says that a flavour so small poured into the sea is immediately resolved in the sea; therefore etc.[783]

[783] RADULPHUS BRITO, *Quaestiones super De sensu et sensato*, q. 23, ms. Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. E.I.252, f. 213va: "Item, illud non est divisibile in infinitum quod divisum usque ad aliquam quantitatem statim resolvitur in continens. Modo partes continui divise sunt huiusmodi, ut dicit Philosophus sic modicus humor infusus mari statim resolvitur in mare; ideo etc."

After this reference, however, Brito is faced with the need to expound Aristotle's problematic remark at 446a10-15, i.e., the issue of what would happen to the sensible qualities of extremely small portions of matter in the absence of the corrupting action of the containing medium. This is a crucial aspect in Brito's discussion. Indeed, the overall doctrine of *minima sensibilia* he presented up to this point appears to be largely dependent on the corresponding doctrine of *minima naturalia* he had presented in his *Physics* commentary. This latter doctrine, however, does not address what would happen in the corrupting action of the containing medium. The specific issue that Aristotle's remark at 446a10-15 forces Brito to address is whether sensible qualities could exist on their own, in the absence of the corrupting action of the containing medium, in portions of matter so small that they would not have the power to perform their proper operation of acting on the external senses so as to engender a sensation. This is a particularly pressing issue for Brito given that, as I have just recalled, his doctrine of *minima naturalia* is focused on the notion of the minimal quantity of matter required for substantial forms in order to perform their proper operation, which, supposedly, is also the minimal quantity of matter required for the accidental forms of sensible qualities in order to perform their proper operation. It is no surprise, therefore, that Brito provides what is probably the first extended debate concerning the relation between the persistence of sensible qualities in material substances and the persistence of the power for them to perform their proper operation. This evolution, moreover, which will lead to the radical innovations represented in their fullest form by Jandun's account of sensible qualities, seems to find a more or less direct precedent in the inchoate discussion of the same subject present in Peter of Auvergne's *De sensu* commentary, pointing to the fact that the debate on this subject, at the Parisian Faculty of Arts, might have originated even one or two decades before Brito. Nevertheless, as seen in the previous chapter, Peter, probably under the influence of Aquinas' doctrine of *minima secundum formam*, simply assumed that, in the absence of the corrupting action of the containing medium, sensible qualities could not, in any case, inhere in portions of material substances smaller than those required for them in order to have the power to perform their proper operation. Brito, instead, for reasons that I will detail below, refuses this straightforward solution and, in this way, provides a largerly original discussion that finds close parallels in the other two *De sensu* commentaries discussed in this section.

In providing his analysis, Brito is certainly guided, once again, by Alexander's authority. Curiously, however, Brito does not only mention Alexander at this point, but he refers, rather, to Alexander and to *Albertus*, to whose authority he later refers also concerning a specific aspect of the discussion. This is a very problematic reference, since the whole issue of what would happen to the sensible qualities of extremely small portions of matter existing on their own in the absence of the corrupting action of the containing medium cannot find any close parallel in Albert's discussion, since, as I have shown in the previous chapter, Albert does not even mention the issue of the corruption by the containing medium in his commentary on *De sensu* 6. Moreover, the crucial passage that Brito quotes from *Albertus* does not derive from Albert's known *De sensu* commentary, while, instead, it finds a close parallel in the commentary preserved in ms. Vat. Lat. 2170.

Be that as it may, a fundamental premiss of Brito's analysis is that Aristotle's remark at 446a10-15 is not interepreted as a thought experiment anymore. That is, the reference to the fact that the remark is based on considering what would happen to the sensible qualities of extremely small portions of matter existing on their own in the absence of the corrupting action of the containing medium is lost. Rather, Brito seems to interpret the remark as considering what happens *during* the process of corruption of small portions of matter existing on their own and of their sensible qualities. In other words, Brito's reasoning here seems to be based on a conception of substantial change which, although not yet foreshadowing Burley's conception of corruption as the inclusive limit of alteration or even the "piecemeal" conception of substantial change that, as I have underlined in the previous chapter, is typical of mature 14th-century Parisian *Physics* commentaries (and which, as I will show below, also fundamentally shapes "mature" 14th-century *De sensu* commentaries[784]), interprets substantial change as a process taking place through an extended interval of time. This would, as already remarked in Chapter 2, introduce an element of tension with Brito's *Physics* commentary, where the corruption of extremely small portions of material substances by the containing medium is taken to

[784] Note that, according to the terminology employed in the previous chapter, with the expression of "piecemeal" conception of substantial change' I refer to the conception, already adopted by both Buridan and Oresme, although with different nuances, according to which substantial forms (and, especially, their powers), are spatially extended and have quantitative parts co-located with the matter they inform, so that, in extremely small portions of matter, each part of them resists for a certain time to the corrupting action of the containing medium. Both this conception and Burley's one are united by their belief in the idea that substantial change broadly conceived is a process happening over an extended interval of time, which is, therefore, (potentially) infinitely divisible.

be an instantaneous process. Nevertheless, the fact that Brito might hold a different position in his *De sensu* commentary is suggested by the following passage:

> Or it can be said [concerning the case of sensible qualities existing in portions of matter too small to be perceived] according to Aristotle that there is no time in which those parts remain [in existence] in act separated from the whole [to which they belong], because immediately they are corrupted and transformed into the containing [medium], and therefore it will be said that those qualities which are in the parts [too small to be perceived] of a continuous [entity] that has been divided in all of its parts are not sensible because they are corrupted[785].

Already from the way in which the passage is formulated it becomes clear that, according to Brito, it is not at all uncontroversial that the corruption by the containing medium of extremely small portions of matter (and of their sensibile qualities, therefore) existing in isolation happens instantaneously. Indeed, it seems that, according to Brito, it is at least possible that in some cases, the process of corruption happens over an extended interval of time, insofar as the portions of matter concerned are able to resist to the action of the containing medium for a certain amount of time[786]. If this is so, however, the existence on their own (at least for a short amount of time during the process of corruption) of portions of matter so small that their sensible qualities do not have the power to act on the external senses so as to engender a sensation, far from being a mere though experiment, becomes a fact of the ordinary course of nature. This is a fundamental theoretical development, since, for the first time in the Medieval Latin world (save for the partially comparable case of Albert), the principle of the coextension of the sensible world and of the perceptible one is rejected not only as a hypothesis, but as an *actual* case. Moreover, this is the main reason, I believe, why Brito feels the urgent need to provide a thorough account of such "imperceptible" sensible qualities, differently, for instance, from Peter of Auvergne. Unless one accepts Aristotle's argument that the corruption of such extremely small portions of material substances (and therefore of their sensible qualities) happens instantaneously, Brito explicitly says in the passage quoted

[785] RADULPHUS BRITO, *Quaestiones super De sensu et sensato*, q. 23, ms. Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. E.I.252, f. 213va: "Vel potest dici secundum Philosophum quod non est dare tempus in quo stant ille partes actu divise a toto, quia statim corrumpuntur et resolvuntur in continens, et ideo dicetur quod ille qualitates que sunt in partibus continui divisi in omnes partes suas non sunt sensibiles quia sunt corrupte."

[786] How, however, this is possible, Brito does not say. Therefore, unfortunately, the text does not provide any indication whatsoever to try to reconstruct on what basis Brito could at least hypothesise that substantial change is a process happening over an extended interval of time.

above, one has to face the task of accounting for "imperceptible" sensible qualities in nature.

The main aspect that Brito has to account for is how an entity that has lost the power to perform its proper operation (in this case, each of the accidental forms of sensible qualities) can still be considered (numerically and essentially) the same that it was when it had the power to perform its proper operation. Brito's solution to this complex issue is presented in the following passage:

> But then remain the doubts that Aristotle and Albert raise. First, because if the sense is said relative to the sensible, then that *minimum* [i.e., any portion of matter that, if existing on its own, would be corrupted by the containing medium, according to Aristotle], since it has a sensible quality, it will have <the potency to move> the sense. It can be said, as Albert says, that the sensible (*sensibile*) is not called [sensible] by itself with respect to the sense, but it can only be called in this way, instead, the same perceived (*sensatum*), and therefore it is not inconvenient that it is sensible something that will never be perceived; also the sensible insofar as [it is] sensible is not perceived, but under the disposition in which it is, it <was> born capable to modify the sense. And therefore that *minimum* does not modify sight, because it does not have the appropriate quantity (*debitam quantitatem*) under which it can modify sight[787].

In the passage, Brito (in analogy with what the two authors of the commentaries preserved in ms. Vat. Lat. 2170 and ms. Vat. Lat. 3061) for the first time (save for Albert's peculiar case) explicitly rejects the validity of Aristotle's principle of the coextension between the sensible world and the perceptible one in the *actual* world. In his model, which is, as I will now show, fundamentally the same adopted by the commentaries of ms. Vat. Lat. 2170 and ms. Vat. Lat. 3061, sensible qualities existing in act always have a *dispositio* to act on the external senses, but such *dispositio* can only be actualised when such sensible qualities are present under a suitable quantity (*sub debita quantitate*) of matter. The idea, which, however, will only be fully articulated by John of Jandun and by the commentators influenced by him, as I will show below, seems to be that a formal entity can be said to

[787] RADULPHUS BRITO, *Quaestiones super De sensu et sensato*, q. 23, ms. Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. E.I.252, f. 213va: "Sed tunc manent dubitationes quas movent Philosophus et Albertus. Primo, quia si sensus dicitur relative ad sensibile, ergo illud minimum, cum habeat qualitatem sensibilem, habebit <potentiam immutandi> sensum. Potest dici, ut dicit Albertus, quod sensibile non dicitur per se ad sensum, sed solum sic dici <potest> immo ipsum sensatum, et ideo non est inconveniens esse aliquod sensibile quod nunquam sentietur; etiam sensibile secundum quod sensibile non sentitur, sed sub dispositione sub qua est, aptum natum <est> immutare sensum. Et ideo illud minimum non immutat[ur] visum, quia non habet debitam quantitatem sub qua possit immutare visum."

be, numerically and essentially, the same when it has lost the power to perform its proper operation than it was when it had this power insofar as the fundamental condition for a formal entity to preserve its numerical and essential identity is the mere possession of the *disposition* to acquire the power to perform its proper operation when present in a suitable quantity of matter. This general principle is not articulated by Brito in the text (nor is articulated in the commentaries preserved in ms. Vat. Lat. 2170 and ms. Vat. Lat. 3061). As I have said, it will only be with John of Jandun's *De sensu* commentary (and, although in a less developed way, in the commentaries most closely associated with it) that, also thanks to the discussion of a crucial argument taken from Averroes' *Long Commentary* on *Metaphysics* Θ, the principle just mentioned will find its proper presentation. Nevertheless, the basic intuition grounding it, for what concerns sensible qualities, seems to be already present in the passage quoted above.

Brito, moreover, already presents all the other main elements that will constitute the backbone of Jandun's own doctrine of *minima sensibilia*, and he also inserts a terminological distinction (which will not be adopted by later commentators) between what is *sensibile* and what is *sensatum*. While the *sensatum* refers to the actual perception of sensible qualities and, by extension, to the sensible qualities perceptible in act, the term *sensibile* is clearly used by Brito to refer both to them and to the sensible qualities which are not perceptible in act. This terminological distinction further shows that Brito is here clearly conscious of the fact that he is "fracturing" the unity of the Aristotelian natural world by clearly expanding the sensible world (which remains coextensive with the natural one) well beyond the perceptible one.

Probably due to his awareness of the innovative character of his proposal, Brito, however, still presents it only as a hypothesis, one, moreover, that is explicitly attributed to 'Albert'. This is a very curious reference[788]. In one sense, Brito would be fully justified

[788] This is not, however, an isolated case in the commentary. Indeed, Juhana Toivanen, who has edited Brito's commentary on *De sensu* 7, notes that there Brito refers twice to Albert's *De sensu* commentary (which is the only previous Medieval Latin commentary quoted explicitly), once with an explicit quotation and the other time with a more general reference. Cf. TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, p. 121. Moreover, a reference to Albert (with an explicit quotation) also featuers prominently in q. 8 of the commentary, edited by Ebbesen (cf. EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, p. 162). Interestingly, however, while the explicit quotation in q. 8 of the commentary finds an actual correspondence in Albert's *De sensu* commentary, the one in q. 25 (p. 178, ll. 14-16 of Toivanen's edition) does not find a precise correspondence in Albert's *De sensu* commentary, exactly as the quotation discussed here.

to refer to Albert, since, as I have argued, Albert is probably the first commentator to propose a doctrine of *minima sensibilia* in which the containing medium does not play any role whatsoever, and in which, therefore, it is fully acceptable that sensible qualities (or, better, "minimal" portions of material substances endowed with the *inchoationes* of their forms) can exist on their own without being perceptible in act. However, Albert's position is never quoted in subsequent discussions on the issue of *minima sensibilia*, and therefore, apart from Brito's reference, there is no evidence whatsoever that his doctrine of *minima sensibilia* was read by subsequent commentators as I have proposed to read it. Moreover, the passage that Brito seems to be quoting from Albert (from whom Brito says he is taking the argument he presents in the text, which is considered as fully alternative to Aristotle's one) does not find any correspondence in Albert's *De sensu* commentary. It might therefore be the case that *Albertus* merely represents a palaeographic corruption for *Alexander*[789]. Indeed, a reference to Alexander, in this passage, would be far easier to understand, given Alexander's extended discussion of sensible qualities that are potentially perceptible in the third sense (and therefore not perceptible in act on their own). Still, it must be remarked that none of the developments presented in Brito's passage can find a precedent in Alexander's commentary, where, moreover, Aristotle's remark at 446a10-15 was taken to be a mere thought experiment.

4.1.2. The Anonymous Commentary of ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170, ff. 117r-131r (Peter of Flanders?)

Before moving on to subsequent stages of development in the Medieval Latin debate on *minima sensibilia*, especially in John of Jandun's *De sensu* commentary, it is time to address directly the two other commentaries that, with Brito's one, testify to the fundamental theoretical change that I have reconstructed (although each in its own peculiar way), i.e., the commentary of ms. Vat. Lat. 2170 and the one of ms. Vat. Lat. 3061.

[789] The fact that *Albertus* might represent a palaeographic corruption, in the commentary, is reinforced by the observation, as mentioned above, that there is at least another reference to Albert's *De sensu* commentary by Brito that does not find any direct correspondence with Albert's known *De sensu* commentary. Note, in any case, that Albertus is explicitly quoted as such, in the passages discussed above, not only in the Florentine manuscript but also in the Leipzig one.

The question commentary of ms. Vat. Lat. 2170, which, as I have said, has been attributed (with some plausibility) to an otherwise unknown Peter of Flanders, and which almost certainly comes from a course at the Parisian Faculty of Arts in the last decade of the 13th century or sometime early in the first decade of the 14th one, discusses the issue of *minima sensibilia* in q. 23, *Utrum passiones sensibiles dividuntur in infinitum divisione continui*.

The commentary's discussion on *minima sensibilia* shows, even more explicitly than Brito's one, the influence of Alexander's commentary, that is already evident in the first part of the *quaestio*. The commentator, for instance, such as Brito, superposes Aristotle's distinction between the division of a continuous entity in unequal and equal parts with that between the potentially infinite sensible parts existing within a continuous entity and the finite sensible parts existing separately from it[790]. Nevertheless, such an influence will become more crucial in the second and more important part of the *quaestio*, where Alexander's authority, as I will now show, will take the place of Albert's one in guiding the discussion concerning sensible qualities existing on their own without being perceptible in act[791].

The commentator's discussion of this issue, however, is part of a section presenting some *dubia* which follows the *determinatio* of the *quaestio*, exactly as in Brito's commentary. The *determinatio* of the commentary of ms. Vat. Lat. 2170 is perfectly in line with Brito's one (and, as I will show, with the one of the commentary of ms. Vat. Lat. 3061), insofar as it is also based on the idea that, while the division of sensible qualities existing within a continuous entity goes on to infinity, the actual separation of the portions of matter with which they are associated from the whole to which they belong is a finite process.

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[790] PETRUS DE FLANDRIA (?), *Quaestiones super De sensu et sensato*, q. 23, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170, f. 128va-b: "Et sicut divisio continui uno modo stat, alio modo non, ita dico de divisione passionum sensibilium per divisionem continui, quia [divisiones] passiones sensibiles cum sunt in partibus continui possunt considerari aut ut sunt in toto et sunt potentia sensibiles, et sic dividuntur in infinitum, aut possunt considerari quantum ad partes separatas a toto, et ut actu sunt sensibiles, et sic divisio stat. [...] quare sicut (sc. continuum) est divisibile in infinitum in partes inequales et eiusdem proportionis, ita passiones sunt divisibiles in infinitum quantum ad partes continui existentes in toto et ut sunt potentia sensibiles et in potentia; quare non est ita minima pars que sit sensibilis, ut est coniuncta alteri parti, scilicet ut est in toto et ita sensatione totius, et ideo in potentia, quia sunt in potentia et ut sic sunt (*ms.* habent) sensibiles sensatione totius, idem in potentia; quare etc."

[791] This, again, reinforces the idea that *Albertus* might represent a palaeographic corruption of *Alexander* in Brito's discussion of *minima sensibilia*.

The claim that the actual separation of the portions of matter of a sensible whole, together with their sensible qualities, is a finite process, is first supported by recourse to the two arguments also presented by Brito. The first one is the traditional statement that there are *minima* (as well as *maxima*) in material substances, therefore, again, connecting the debate on *minima sensibilia* with that on *minima naturalia*, although without making any explicit reference to *Physics* I.4 (or to any other Aristotelian text, such as *De anima* II.4)[792]. The second one is the argument presented by Aristotle at 446a7-10, namely, the corruption by the containing medium of extremely small portions of matter existing in isolation and of their sensible qualities[793]. After these two arguments, however, the commentator also inserts a third argument which is absent from Brito's discussion, and that seems to be a rather idyosinchratic element. Indeed, the commentator makes again recourse to the parallel established between the division of a continuous entity in unequal and equal parts and the division of sensible qualities insofar as they are part of a given whole or of portions of matter separated from it, respectively. Although the passage is quite obscure, he seems to claim that exactly because the sensible qualities of portions of matter separated from the whole to which they belong correspond to the equal parts into which a continuous entity can be divided, and the latter are finite, so too are the former[794].

[792] PETRUS DE FLANDRIA (?), *Quaestiones super De sensu et sensato*, q. 23, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170, f. 128vb: "Secundum demonstratur, scilicet quod ut partes sunt separate a toto, et secundum quod passiones sunt sensibiles, divisio earum stat. Primo declaratur sic: in quolibet naturali est dare maximum et minimum, scilicet ut secundum se com<pre>henditur et in actu <est>; passiones sensibiles sunt aliqua naturalia; quare per divisionem, separando partes continui a toto, deveniendum est ad ita parvam quantitatem quod sub minori non starent."

[793] PETRUS DE FLANDRIA (?), *Quaestiones super De sensu et sensato*, q. 23, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170, f. 128vb: "Secundo sic: illa que sunt ita parva que non possunt resistere corrumpentibus resolvuntur in continens et sic non dividuntur in infinitum, sed per divisionem deveniendum est ad aliqua sensibilia ita parva que non possunt resistere corrumpentibus, ut aeri aut aque; quare subito (*ms.* so) resolvu<n>tur in continens, et sic (non dividuntur in infinitum, *ms. del.*) divisio earum non vadet in infinitum, sicut sapor infusus mari, quia non potest resistere mari <et ideo> resolvitur in continens, ita quod amplius secundum se non remanebit ille sapor, et sic dividendo passiones sensibiles secundum divisionem continui divisio illarum stat prout partes sunt separate a toto."

[794] PETRUS DE FLANDRIA (?), *Quaestiones super De sensu et sensato*, q. 23, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170, f. 128vb: "Tertio declaratur quod divisio illa stat quantum ad sensibilitatem, scilicet quod non sunt actu sensibiles, quia divisio passionum sensibilium sequitur divisio continui, scilicet loquendo de divisione per <partes> actuales de quibus nunc est sermo. Sed ut determinatum est supra divisio continui quantum ad partes equales stat; quare et divisio passionum quantum ad partes equales stat. Sed totum est sensibile, quare et divisio passionum stat quantum ad hoc, quod partes sunt sensibiles, quia sic est divisio quantum ad partes equales; quantum nam ad sensibilitatem partes dicuntur equales que sunt sensibiles sicut et totum. Sed si quelibet pars continui quantumcumque minima haberetur <ad> (*ms. del.* sicut) invicem (?) non staret divisio illa quantum ad equales partes; quare divisio passionum sensibilium stat quantum ad sensibilitatem, scilicet quantum ad hoc quod sint actu sensibiles, et ideo Philosophus premittit illam divisionem continui quantum ad partes equales et inequales, quia secundum hoc stat solutio questionis."

After this section, however, exactly as in Brito's commentary, the commentator is faced with Aristotle's remark at 446a10-15, to which he devotes the first of two *dubia* constituting the last part of the *quaestio*:

> But here two *dubia* are considered. Firstly, because it appears to follow from what has been said that there is some sensible body, i.e., [a body] that is sensible by its potency and by its nature, because it possesses that which is the principle of perceptibility (*principium sensibilitatis*), that will not be perceived due to the smallness of its quantity[795].

Contrary to what has been seen in Brito's commentary, in this commentary there is no explicit hint at the idea that the reason to raise this *dubium* might be related to the belief that the corruption by the containing medium does not happen instantaneously. Yet, it seems rather possible that this idea is present in the background of the commentator's discussion. This emerges by looking at the solution to the *dubium* provided by the commentator:

> To the first [i.e., *dubium*] it must be said that through the potential division [of a sensible whole] it is to be found something sensible that is so small that it will not be perceived due to the defect of [its] quantity, such as clearly says Alexander, because nothing is sensible if not through [its] sensible qualities that are the principle (*principium*) of sensation. This, however, is not [the case] if not in [a certain] quantity, such as Aristotle says that nothing is sensible if [it is] not a quantity, and therefore [the sensible] is under a determined quantity, because the operation (*opus*) of any natural entity is determinate; because etc. Hence [Aristotle] says that even though this sensible has the first act (*actum primum*), i.e., [the fact] that through its power (*per virtutem suam*) is the causal principle of perceptibilty (*principium motivum sensibilitatis*), still it does not have the sensible act (*actum sensibilem*), i.e. [the power] to move the sense in act, and this is due to the defect of quantity, because it is not under that determined quantity under which the sense was born to cognise a certain [sensible quality].[796]

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[795] PETRUS DE FLANDRIA (?), *Quaestiones super De sensu et sensato*, q. 23, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170, f. 128vb: "Sed hic videntur duo dubia. Primo quare [quia] videtur haberi ex dictis quod sit aliquod corpus sensibile, scilicet quod potentia sua et natura sua est sensibile, quia habet id quod est principium sensibilitatis, quod propter parvitatem sue quantitatis non sentietur."

[796] PETRUS DE FLANDRIA (?), *Quaestiones super De sensu et sensato*, q. 23, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170, ff. 128vb-129ra: "Ad primum dicendum est quod per divisionem potentiale<m> est dare aliquod sensibile quod erit ita parvum quod non sentietur propter defectum quantitatis, ut plane vult Alexander, quia nullus est sensibile nisi per passiones sensibiles que sunt principium sensationis. Hoc autem non est nisi in quantitate, ut dicit Philosophus quod nullus est sensibile nisi quantum, et ideo est sub determinata (*ms.* determinate) quantitate, quia opus cuiuslibet naturalis est determinatum; quare etc. Unde dicit quod licet hoc (?) sensibile habeat actum primum, scilicet quod per virtutem suam |f. 129ra| est principium motivum sensibilitatis, tamen non habet actum sensibilem, scilicet actu movere sensum, et hoc est propter defectum quantitatis, quia non est sub illa determinata quantitate

The first important element to remark in the passage is that the commentator, such as Brito, does not make any reference to the fact that the issue of sensible qualities existing on their own without being perceptible in act is an issue to be considered as part of a thought experiment. Rather, although he explicitly refers to Alexander as the source of the *dubium* he is here discussing, the scenario he presents is quite different from Alexander's one (and also, apparently, from Brito's one). Indeed, the commentator does not refer anywhere to the fact that he is here conducting a thought experiment, and no hypothetical statement whatsoever can be found either in this passage or in the discussion of the first *dubium* more generally. Instead, there is a mention, at the outset of the passage, of the fact that the scenario referred to is the one that arises through the potential division of a sensible whole. What does the commentator mean with this expression? Indeed, in the preceding part of the *quaestio* he has made no use of this expression, which will not figure in what follows either. My idea, although of course there is no direct textual support for it, is that here the commentator has in mind the division (in act) of a sensible whole that goes beyond what he has previously called the *divisio per partes actuales*, namely, the division (the real separation) of a sensible whole in parts capable of existing on their own.

sub qua sensus natus est al<i>q<ua>m (sc. sensibilem qualitatem) apprehendere." Some traces of a similar position, one also making recourse to the distinction between the *actus primus* of sensible qualities and their *actus secundus*, can be found in Richard of Middleton's *Quodlibeta*, as already quoted in Chapter 2: "Unde et Philosophus *De sensu et sensato* [cf. *De sensu* 6, 445b3-446a20] videtur velle quod sensibile per divisionem magnitudinis devenit ad quantitatem secundum quam non potest movere sensum in actu; sed tamen est sensibile in potentia ad movendum sensum, ita quod coniunctum cum alio posset movere in actu. Sic ergo patet quod sensibile potest esse ita parvum, quod quamvis esset sensibile in actu primo, inquantum habet formam ipsius sensibilis, tamen non esset actu sensibile quantum ad actum secundum, qui est movere sensum" (RICHARDUS DE MEDIAVILLA, *Questiones Quodlibetales*, Venetiis, 1509, III, q. 5, f. 31rb-va). Unfortunately Richard's passage, which has the stated purpose of using *De sensu* 6 in order to argue for an analogous' view in the case of *minima naturalia*, does not provide enough context to judge whether the theologian is discussing what would happen in the absence of the corrupting medium or not, and, in any case, whether he is admitting the existence on their own, in the actual world, of sensible qualities that are not perceptible in act or not. Still, his views clearly seem to be part of the same period and intellectual context of those of the commentators discussed in this section and, what is more, they also go beyond them by making explicit reference to the "corpuscularian" implications of the third meaning of 'potentially perceptible'. If, however, one accepts the probable dating of Richard's third *Quodlibet* to 1286-1287, then it should be admitted that the views on *minima sensibilia* expounded by the commentators analysed in this section, and especially by the author of the commentary of ms. Vat. Lat. 2170, have their roots before 1290. As I said in the previous chapter, however, lacking any *De sensu* commentary from Paris which can be dated with some probability between 1270 and 1290, apart from Peter of Auvergne's commentary, it is very hard to establish any absolute chronology in this respect.

Yet, as the commentator has stated in the previous part of the *quaestio*, parts of a sensible whole too small to exist on their own are corrupted by the containing medium. If this is so, then, the only way to understand how a division (a real separation) of a sensible whole that goes beyond the parts capable of existing on their own can take place is by appealing, once again, to a temporally extended conception of substantial change. The idea, indeed, although it does not figure as explicitly as in Brito's commentary, seems to be, once again, that the corruption of extremely small portions of material susbtances existing on their own (and therefore of their sensible qualities) happens over an extended interval of time. To put it in other words, once a temporally extended conception of substance change is taken as a premiss, it becomes clear that the commentator is using the expression of the '*divisio potentialis*' of a sensible whole to discuss the case in which the parts of a whole that are too small to exist on their own separately from it (and whose sensible qualities are not perceptible in act on their own) come to exist on their own, for a certain amount of time, *during* the process of corruption of the sensible whole to which they belong. If this is so, then, the passage becomes entirely intelligible and substantially in agreement with Brito's parallel discussion. Indeed, with the help of a different (and certainly more refined) terminology than Brito's one, the commentator, in agreement with Brito, states that the sensible qualities of such portions of matter exist on their own (for a certain amount of time) without being perceptible in act, since the perception in act of sensible qualities requires that they are associated with a sufficient quantity of matter, a belief that the commentator explicitly traces back to Alexander's commentary (and also to Aristotle, although in a more indirect way, by appealing to his statement that what is sensible is always a quantity – insofar as sensible qualities always exist within extended magnitudes). More than that, the commentator, going beyond Brito, also remarks that any natural operation whatsoever, not only that of acting on the external senses, requires a certain quantity of matter to be performed.

Refining his solution, then, the commentator distinguishes between two different acts of sensible qualities with regard to perceptibility. There is a first act (*actus primus*) according to which a sensible quality is sensible in act, as I would put it, insofar as it has in itself the causal principle of sensation (*principium motivum sensibilitatis*), that is, a disposition to act on the senses or, better said, a disposition to acquire the power to act on the senses (an aspect that will become clearer in Jandun's discussion of *minima*

sensibilia). However, such disposition (or first act) does not entail the possession of a second act, namely, what the commentator calls the '*actus sensibilis*', according to which a sensible quality is not only sensible in act, but also perceptible in act, that is, has the power to act on the external senses so as to engender a sensation. This second act is, however, only possessed by a sensible quality (existing on its own) once it is associated with a sufficient quantity of matter. All this terminology, further detailing Brito's passing reference to the difference between a *sensibile* and a *sensatum*, goes in the very same direction, namely, that of denying the validity, in the actual world, of the principle of the coextension of the sensible world and of the perceptible one. Nevertheless, it is also clear from the commentator's analysis that, more than Brito, he has also clear in mind that his belief that it is possible that a sensible quality exists on its own without ever being able to perform its proper operation, namely, that of acting on the external senses, seems to violate the metaphysical principle (effectively epitomised by Averroes' argument from the *Long Commentary* on *Metaphysics* Θ which will be used by Jandun), according to which an entity which is not able to perform its proper operation also loses its essence. The commentator, to be clear, does not mention Averroes' argument, and he certainly does not discuss the issue in such explicit terms (as Jandun would do a few years later). However, the reference to the fact that *opus cuiuslibet naturalis est determinatum* seems to point to the idea that the proper operation of any natural entity, according to the commentator, requires a certain quantity of matter in order to be performed, so that such entity would lose its essence only if did not acquire the power to perform its proper operation when it were present in such a quantity of matter.

After this discussion, however, the commentator raises an objection to his solution of the first *dubium*, which is of extreme interest to this thesis, since it introduces a new aspect into the Medieval Latin discussion of *minima sensibilia*, one that, as far as I have been able to determine, cannot be found in previous commentaries (although it is partially prefigured in the commentaries attributed to Buckfield), and that can also be found in a contemporary commentary, namely, the one contained in ms. Vat. Lat. 3061, as I will show below:

> But against this [i.e., the solution to the first *dubium*]: a sensible and [its corresponding] sense are correlative, i.e., an active and [its corresponding] passive, therefore in what way will there be an active [i.e., a sensible quality that is not perceptible in act, albeit having the *principium motivum sensibilitatis*] without [its

> corresponding] passive [i.e., the external sense corresponding to that sensible quality], given that correlatives are together? It must be said that there can well be an active without [its corresponding] passive, and this due to an obstacle (*impedimentum*) in one or in another, so that there will well be an active in potency (*activum in potentia*), i.e., that has the potency to act, not, however, a passive, i.e., [that] which is acted upon in act by that [active], but there is no active in act (*activum in actu*) without the existence of a [corresponding] passive, because the active in act (*activum in actu*) and the [corresponding] passive in act (*passivum in actu*) are a single act, such as it is said in *De anima* Book II and III. And one of such entities does not exist without the other, and so the active and [its corresponding] passive, insofar as they are relative, are together, because the active in potency and the passive in potency are referred to each other, and so one does not exist without the other; similarly the active in act and the passive in act, although it is not necessary that if there is an active in potency there is [its corresponding] passive [in potency], because it might happen an obstacle in one [of them][797].

The passage focuses on the relational character of sensible qualities, therefore adressing heads-on the belief that grounds the Aristotelian principle of the coextension between the sensible world and the perceptible one. Insofar as a sensible quality is defined by its ability to act on the senses (as Aristotle claims in the argument against the infinite divisibility *per accidens* of sensible qualities at the beginning of *De sensu* 6), how can it be that an active power (a sensible quality) exists on its own without being perceptible in act, that is, without a corresponding passive power (a sensory power) that can perceive it? The fact that previous commentators did not deem the issue worthy of discussion (not using the terms proper to the category of relation, at least, with the partial exception of Adam of Buckfield, as seen in the previous chapter) is probably due to the fact that in the seventh chapter of the *Categories* (7b34-8a12) Aristotle discusses the dependency between the two terms of the relation which is represented by sensation, and he clearly states that, while a sensation cannot exist without its corresponding sensible object, certainly a sensible object can exist without its corresponding sensation, that is, without being perceived by a living being endowed with sensory powers. Still, the discussion

[797] PETRUS DE FLANDRIA (?), *Quaestiones super De sensu et sensato*, q. 23, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170, f. 129ra: "Sed contra ista, [scilicet] sensibile et sensus sunt correlativa, scilicet activum et passivum, quomodo ergo erit activum et non passivum, quia correlativa simul sunt? Dicendum quod bene est activum non tamen passivum, et hoc propter impedimentum in uno vel in alio, ita quod bene est activum in potentia, scilicet quod habet potentiam agendi, non tamen erit passivum, scilicet quod actu patiatur ab illo, sed activum in actu non est quin sit passivum, quia activum in actu et passivum in actu est unus actus, ut dicitur secundo et tertio *De anima*. Et talium unum non est sine altero, et sic activum et passivum ut sunt relativa sunt simul, quia activum in potentia et passivum in potentia referuntur ad invicem, et sic unum non est sine altero; similiter activum in actu et passivum in actu, licet non oporteat quod si sit activum in potentia [quod] sit passivum, quia impedimentum in aliquo potest [tangere] contingere."

conducted in the *Categories* is exclusively concerned with sensible objects (and sensible qualities) that are perceptible in act, insofar as, in Aristotle's worldview, as I have argued at length, there is no space for sensible qualities which are not perceptible in act. As a consequence, it is clear that the discussion conducted in the *Categories* merely concerns the case in which, for contingent reasons, a given sensible object (for instance because it is placed somewhere where it is particularly difficult to be reached) has never been perceived by a being endowed with sensory powers. However, as soon as one of them will reach it, the object will immediately be perceived. Nothing in this reasoning threatens the principle of the coextension of the sensible world and of the perceptible one.

Nevertheless, the commentator seems to be here trying to extend Aristotle's reasoning in the *Categories* (also taking advantage of some remarks from the *De anima*) so as to apply it to the case of sensible qualities which are not perceptible in act. His worry seems to be that, on the new understanding of sensible qualities that he (such as Brito) is proposing, sensible qualities would completely lose the relational character that defines them. In order to avoid committing himself to this idea, the commentator introduces a fundamental distinction between an *activum in potentia* and an *activum in actu*, and, correspondingly, between a *passivum in potentia* and a *passivum in actu*. An *activum in actu* is a sensible quality that is being perceived in act by the corresponding external sense, therefore, by a *passivum in actu*. Instead, an *activum in potentia* is a sensible quality that is not being perceived in act (regardless of the fact that it is perceptible in act or not). On his model, while it is clearly contradictory that to an *activum in actu* does not correspond a *passivum in actu*, since the two, as the commentator rightly remarks, are part of a single act, there is no problem whatsoever in admitting that there is an *activum in potentia* without a corresponding *passivum in potentia*. This is, indeed, the case discussed by Aristotle in *Categories* 7, of a sensible quality that, while being perceptible in act, is outside of the reach of any sensory power, for some contingent reason (what the author of the commentary refers to as an *impedimentum*). However, so the commentator seems to argue, if there is no problem in admitting that there is an *activum in potentia* to which does not correspond a *passivum in potentia* in the case of sensible qualities which are perceptible in act, why should there be any problem in admitting that there is the same asymmetry in the case of sensible qualities which are not perceptible in act? Of course, the argument is unsound, since it plays on the semantical ambiguities of *activum in*

potentia, *passivum in potentia* and also of *impedimentum*. Indeed, in the case of sensible qualities which are not perceptible in act, an *activum in potentia* is a sensible quality that, as the commentator said, possesses the *principium motivum sensibilitatis*, but cannot ever become an *activum in actu*. On the contrary, the possibility to become an *activum in actu*, under suitable conditions, is exactly what characterises an *activum in potentia* in the case of sensible qualities that are perceptible in act. The ambiguity is even greater with respect to the *passivum in potentia*. In the case of sensible qualities that are not perceptible in act, indeed, the *passivum in potentia* should be a sensory power stronger than any of those that can exist in nature and, at the limit, a (potentially) infinite one, something which is entirely unacceptable in the Aristotelian worldview[798]. Indeed, the *impedimentum* that prevents an *activum in potentia* to become an *activum in actu*, in the case of sensible qualities that are not perceptible in act, is a necessary one, and not a contingent one, as it were in the case of sensible qualities perceptible in act.

Be that as it may, the argument is interesting in its originality, and also in the fact that it shows that even commentators who abandoned the Aristotelian principle of the coextension of the sensible world and of the perceptible one in the actual world, and that therefore admitted the existence on their own, in the actual world, of sensible qualities that are not perceptible in act, still felt the need to provide a relational characterisation of sensible qualities and of their essence. It is exactly this aspect that distinguishes commentators such as Brito and the two anonymous Vatican commentators from the approach taken by Jandun, who will not only defend the existence on their own, in the actual world, of sensible qualities that are not perceptible in act, but who will also try do find a definition of sensible qualities in predominantly non-relational terms.

The need to provide a relational characterisation of sensible qualities is also what motivates the fact that, in the commentary at hand, after the discussion of the first *dubium* a second one is analysed concerning the fact that, if sensible qualities existing on their own are (potentially) infinitely divisible *per accidens* according to the division of matter, then the corresponding sensory powers should be (potentially) infinitely augmentable. The *dubium* is raised, indeed, by appealing explicitly to the solution of the first *dubium*

[798] And there seems to be no reason why the author of this commentary, such as any of the authors of the other commentaries analysed in this and in the previous chapter, should reject this particular aspect of the Aristotelian worldview

that I have just analysed[799]. More in general, the commentator never puts into doubt, while discussing this issue, what he already assumed in the discussion of the first *dubium*, namely that under no condition whatsoever can a sensory power be augmented to infinity (or in any case beyond the limits fixed by the ordinary course of nature).

This aspect allows me to underline a last aspect that emerges from the commentary of ms. Vat. Lat. 2170's discussion on *minima sensibilia*, an aspect which, however, is basically common to all Medieval Latin *De sensu* commentaries. Even when commentators started to admit the existence of (potentially) infinitely small sensible qualities existing on their own, or, better said, of minimally extended sensible qualities existing on their own, they never tried to claim that sensory power can, correspondingly, be (potentially) infinitely augmented. The only commentator who, as seen, tries to take such a view, namely, Thomas Aquinas, only states that it is necessary to conceive such a (potentially) infinite augmentation in a possible world in which the portions of matter existing on their own endowed with their sensible qualities are (potentially) infinitely small. Not, however, in the actual world. The fundamental asymmetry, therefore, between the infinite in division and the one in "addition", so to speak, or in intensity (an attribute which is proper only to God) is a fundamental aspect that, while generally characterising Medieval Latin Aristotelian natural philosophy, emerges with particular relevance in the case of the debate on *minima sensibilia*.

4.1.3. The Anonymous Commentary of ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3061, ff. 145r-150r

A doctrine of *minima sensibilia* analogous to the one found in Brito's commentary and in the commentary of ms. Vat. Lat. 2170, although with its specifities, can also be found, as I have mentioned, in the commentary of ms. Vat. Lat. 3061. The author of this commentary discusses the issue of *minima sensibilia* in q. 24, *Utrum passiones visibiles dividantur in infinitum*.

[799] PETRUS DE FLANDRIA (?), *Quaestiones super De sensu et sensato*, q. 23, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170, f. 128vb: "Secundo, quia videtur velle Philosophus quod si passiones sint divisibiles in infinitum quantum ad partes inexistentes toti, et potentia sensibile, vere oporteret quod sensus augmententur in infinitum in subtilitate, quia unum est activum et alium passivum. Modo est dare activum sine passivo, ut videtur."

The *quaestio*, as the corresponding ones of both Brito's commentary and that of ms. Vat. Lat. 2170, also interprets Aristotle's doctrine of *minima sensibilia* as being that, while sensible qualities are infinitely divisible *per accidens* through the (imaginative) division of a sensible whole in its parts (parts that are potentially sensible insofar as they contribute to the actual perception of the whole to which they belong), the division of sensible qualities existing on their own (and being perceptible in act) in portions of matter separate from the whole to which they belong is finite. Moreover, although this is less explicit than in the two other commentaries considered in this section, also in this commentary this distinction is largely superposed to the Aristotelian one concerning the division of a continuous entity in unequal and in equal parts respectively.

The commentator also largely follows the other two in listing the arguments in support of Aristotle's doctrine. Firstly, indeed, he generally states the fact that in natural entities there are *minima* (therefore using a formulation closer to that of the commentary of ms. Vat. Lat. 2170 than to the one provided by Brito, who also explicitly referred to the text of *Physics* I.4 in this respect)[800]. In this way, also the author of this commentary strongly connects the debate on *minima naturalia* with that on *minima sensibilia*. Secondly, moreover, he mentions the fact that the sensible qualities of extremely small portions of matter existing in isolation would be corrupted by the containing medium[801].

At this point, however, also this commentator is confronted with the need to discuss Aristotle's remark at 446a10-15. Interestingly, he chooses to present it as an interpretative issue arising from Aristotle's text: Aristotle appears to admit, so the commentator frames the issue, after the presentation of his doctrine of *minima sensibilia*, that "in the parts separate from the whole [to which they belong] it is [possible] to reach a sensible part that cannot, due to its smallness, modify the sense[802]". The important aspect to remark in the commentator's formulation is, evidently, the fact that even in his

[800] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 24, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3061, f. 150ra: "Dico tunc quod passiones sensibiles non dividuntur in infinitum quantum ad partes separatas a toto, quia id non potest dividi in infinitum in quo est dare minimum, sed in talibus passionibus est dare minimum, ita quod ulterius illud non potest dividi sic quod formam naturalem retineat, quia in naturalibus est dare minimum."

[801] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 24, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3061, f. 150ra: "Item, per divisionem istam <est> devenire ad ita parvum, quia si ulterius dividatur resolveretur in continens, et in divisione continui secundum partes equales stat."

[802] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 24, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3061, f. 150ra: "Philosophus aliter hic ulterius, ut videtur, <dicit> quod in partibus separatis a toto sit deve<n>ire ad partem sensibilem que non possit parvitate (*ms.* separatione) immutari (*ms.* immutandi) sensum."

case it is rather clear that the issue of sensible qualities existing on their own without being perceptible in act is an issue concerning the actual world, and not a hypothetical one regarding a possible world where there is no corrupting action of the containing medium. Yet, from this initial statement, it is impossible to discern what scenario the commentator has in mind. This will, however, become clear through his subsequent discussion.

Initially, the commentator feels the need to stress that the existence on their own of sensible qualities that are not perceptible in act has the unwelcome consequence of forcing one to posit the existence of an active power without its corresponding passive one, therefore showing that the relational language already found in the commentary of ms. Vat. Lat. 2170 was evidently quite common in discussions of *minima sensibilia* at the Parisian Faculty of Arts at the turn of the century:

> But it must be said how [it] <is> [possible] to posit a *minimum* in this way. According [to the principle] that, since the sensible is active, and so the sense is passive, and active and passive are in a relation of correspondence (*concordans*), it must be posited an active [that is active] on [its corresponding] passive, or viceversa. Moreover, the sensible is active, and the sense is passive, and therefore it appears that <if> the sensible goes on to infinity concerning parts existing in act, so it will be needed that the sense augmented in [its] discerning power goes on to infinity[803].

Before, however, trying to elaborate an account of the relation between sensible qualities and their corresponding senses that can be valid for sensible qualities existing on their own without being perceptible in act (an account to which I do not devote any space here, since it is perfectly in line with, although more generic than, the one developed in the commentary of ms. Vat. Lat. 2170), the commentator goes on to develop his own conception of sensible qualities existing on their own without being perceptible in act, therefore providing his interpretation of Aristotle's remark at 446a10-15:

> But concerning the [issue] at hand, it must be said that it must be <posited> a sensible so small that it has an insufficient quantity to be perceived. Indeed, the operation does not proceed from the natural form without qualification (*non a forma naturali*

[803] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 24, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3061, f. 150ra: "Sed dicendum quomodo <sit> ita dare minimum. Secundum quod, cum sensibile sit activum, et ita sensum sit passivum, et activum et passivum sint (*ms*. sunt) concordans, est ponere activum suo passivo, vel e converso. Item, sensibile est activum, et sensus passivus, et ideo videtur quod <si> sensibile procedat in infinitum quo ad partes existentes in actu, sic oporteret quod sensus maioratus (*ms*. maioratum) in sensibilitate vadat in infinitum."

> *procedit absolute operatio*), but from the form such as it exists under a determined quantity, and therefore, even though the sensible has the sensible form under which it remains for some time (*quantum ad aliquod tempus*), still it will not be perceived if it does not have the determined quantity which is required to this [effect], that something could act on the sense. But you will say: such as this quantity [is required] to preserve the natural form, so it must be a quantity sufficient to this [effect], that the operation proceeds from the form. It must be said that this is not the case, because a greater quantity is required so that the form can go on in its operations, than to this, that the natural form is preserved, because the power in operation is the last potency [of a natural form], as it is said in *De caelo et mundo* Book I [cf. *De caelo et mundo*, I.12, 281a11-12][804].

The passage is of great importance for the hypothesis that I have advanced in this section, namely, that Brito and, although less evidently, the author of the commentary of ms. Vat. Lat. 2170, when discussing the issue of sensible qualities existing on their own without being perceptible in act as a real case, and not merely as a hypothetical one, have in mind a temporally extended conception of the corruption of extremely small portions of matter and, therefore, of their sensible qualities by the corrupting action of the containing medium. In this passage, the author of the commentary of ms. Vat. Lat. 3061 not only says quite explicitly that he has in mind such a conception, but he also goes on to apply this model directly to the process of corruption of sensible qualities by the containing medium. Indeed, he seems to claim that, when a portion of matter too small to resist to the corrupting action of the containing medium is separated from the whole to which it belongs, its sensible qualities immediately lose the power to act on the external senses, since, by Aristotle's own doctrine, such a part is a part which is too small to be perceived. Still, since the corruption of such a portion of matter (of its substantial form) happens over an extended interval of time, it still retains for some time (the commentator explicitly says *quantum ad aliquod tempus*) the accidental forms of its sensible qualities. In this way, what in Brito was merely suggested as a theoretical possibility, and what remained

[804] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 24, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3061, f. 150ra: "Sed ad propositum dicendum est quod sensibile est <dare> ita parvum quod habet defectum in quantitate ut sentiretur. Nam non a forma naturali procedit absolute operatio, sed a forma ut sub determinata quantitate existente, et ideo licet sensibile habeat formam sensibilem sub qua stet quantum ad aliquod tempus, non tunc sentiretur nisi habeat determinatam quantitatem qui requiritur ad hoc quod aliquid possit agere in sensum. Sed tu dices: sicut est ista quantitas <sufficiens> ad servandum formam naturalem, ita debet esse quantitas sufficiens ad hoc ut procedat operatio absque forma. Dicendum quod id non videtur, quia maior quantitas requiritur ut (*ms.* quod) forma procedat <in> operationibus, quam ad hoc quod id conservetur forma naturalis, quia virtus in operatione est ultima potentia, ut dicitur primo *Celi et mundi*."

only discernable in a blurry way in the commentary of ms. Vat. Lat. 2170, here comes to full light.

More than this, the commentator also explicitly states, in reply to the objection he raises, that the quantity required for the accidental forms of sensible qualities (and, indeed, for any form whatsoever) to perform its proper operation is higher than the one required for it to exist. This is a very important statement, since it implies an explicit rejection of the principle that grounded Peter of Auvergne's solution to the issue of *minima sensibilia* and that, as seen, was still the one grounding Brito's solution to the issue of *minima naturalia*, although it had been abandoned in the course of Brito's discussion of the issue of *minima sensibilia*. According to the model thus provided by the author of the commentary of ms. Vat. Lat. 3061, grounded on an appeal to an *auctoritas* from *De caelo et mundo* I (apparently an innovative move by the author of this commentary in the debate on *minima sensibilia*)[805] the power to perform its proper operation is not a "necessary condition", so to speak, for a form to exist. Rather, such power is what the commentator calls the "last potency" (*ultima potentia*) of any form, meaning that such a form (in this case, the accidental ones of sensible qualities) can be actualised to a sufficient degree (although, arguably, not a complete one) wihtout the power to perform its proper operation. In this sense, the commentator's statement comes closer than what could have been found in Brito and in the commentary of ms. Vat. Lat. 2170 to provide a characterisation of the ontology of sensible qualities which tentatively provides a reply to Averroes' argument from the *Long Commentary* on *Metaphysics* Θ (which, however, is not even in this case mentioned by name).

It follows from this model that this commentary is probably the one, among the three analysed in this section, where the Aristotelian principle of the coextension of the sensible world and of the perceptible one is refuted in a stronger and more vehement way. It is nevertheless clear that all three commentaries, each in its own way, testify to a broader intellectual development that was taking place at the Parisian Faculty of Arts around the turn of the century, and according to which the existence on their own of

[805] Cf. J. HAMESSE (ed.), *Les* Auctoritates Aristotelis*: un florilège médiéval. Étude historique et édition critique*, Louvain-Paris, Publications Universitaires-Béatrice-Nauwelaerts, 1974, p. 160, 6, and p. 162, 37.

sensible qualities that are not perceptible in act was starting to be conceived as a feature of the (actual) natural world[806].

4.1.4. The Emergence of a New Doctrine of *Minima sensibilia* at the Parisian Faculty of Arts at the Turn of the Century: A Summary

The main feature that all the three *De sensu* commentaries just analysed have in common is a reflection on the conditions under which sensible qualities can exist without the power to perform their proper operation, i.e., that of acting on the external senses so as to engender a sensation. This reflection, in them, differently from previous *De sensu* commentaries, takes on a special urgency, however, insofar as they all seem to accept that such "imperceptible" sensible qualities can exist in the actual world, at least for a short span of time. The reason for this appears to be a temporally extended conception of the process of corruption of extremely small portions of homogeneous material substances separated from the whole to which they belong. According to this view, throughout such a process of corruption increasingly smaller (at the limit, potentially infinitely small) portions of material substances endowed with their own sensible qualities come to exist at least for an instant, and, in any case, for a short interval of time (*quantum ad aliquod tempus*, to use the expression adopted in the commentary of ms. Vat. Lat. 3061). The characterisation of such sensible qualities as 'sensible', however, poses a problem. Indeed, how is it possible that something that has lost the power to perform its proper operation can still be (numerically and essentially) the same sensible qualitiy that had such a power? The solution proposed by these commentators, although with a varying terminology and with different nuances, is based on the idea that what matters for a sensible quality in order to remain (numerically and essentially) the same sensible quality is that it has the disposition to acquire the power to perform its proper operation when is is present in a sufficient quantity of matter[807]. It is this basic intuition that, although founded upon a different basis, developed in a much more refined discussion and put into an overarching

[806] For what concerns, instead, the problem of the corresponding augmentation to infinity of the sensory powers, or in any case beyond the limits set in nature, the commentator, again, basically restates, in a shorter way, what had already been stated in the commentary of ms. Vat. Lat. 2170.
[807] In the commentary of ms. Vat. Lat. 3061, this intuition is coupled with the more general claim that the quantity of matter required for any formal entity whatsoever in order to have the power to perform its proper operation is higher than the one required for it to exist in a concrete hylomorphic compound.

metaphysical framework, will ground the innovative conception of sensible qualities proposed by John of Jandun (and by the commentators most closely associated with him) in the course of his discussion of *minima sensibilia*.

The main consequence of the position adopted by the three commentators discussed in this section is a rejection of the principle of the coextension of the sensible world and of the perceptible one, not only in a possible world deprived of the corrupting action of the containing medium, but also in the actual one. According to them, it is perfectly possible that something is sensible (a *sensibile*, using Brito's terminology), insofar as it is the causal principle of sensation (the *principium motivum sensibilitatis*, to use the terminology of the commentary of ms. Vat. Lat. 2170), although such principle is never actualised and the entity in question, as a consequence, never becomes what Brito calls a *sensatum*, i.e., an entity that is perceptible in act on its own. To use, again, the terminology of the commentary of ms. Vat. Lat. 2170, such an entity would possess the *actus primus* (i.e., existence in act as a sensible quality) without possessing its *actus sensibilis* (i.e., the power to perform its proper operation, that is, that of acting on the external senses so as to engender a sensation).

Moreover, as the two commentaries of ms. Vat. Lat. 2170 and ms. Vat. Lat. 3061 explicitly thematise, this view also has the consequence that sensible qualities partially lose the relational character that characterises them in the Aristotelian worldview. Indeed, according, again, to the terminology employed in the commentary of ms. Vat. Lat. 2170, while it is certainly true that sensible qualities and their corresponding external senses are correlative entities, it is not always the case that, in order for one of them to exist, also the other one has to exist. More precisely, while, when an entity endowed with an active entity is acting onto its corresponding passive one, the two entities (what the commentary calls an *activum in actu* and a *passivum in actu*) must of course exist together, this is not necessarily the case when no action is being performed. It is, in this sense, perfectly acceptable that an *activum in potentia* exists without its corresponding *passivum in potentia*, as in the case of "imperceptible" sensible qualities.

The three commentaries discussed in this section, therefore, come already close to Jandun's innovative understanding of sensible qualities, as I will show below. What is conspicuously missing, instead, from the three commentaries, is any discussion of the “corpuscularian” implications of Aristotle’s remark at 446a10-15. Such a discussion,

coupled with the acceptance of the existence on their own, in the actual world, of sensible qualities that are not perceptible in act, although on a basis different from a temporally extended conception of substantial change, was developed, in the years immediately following these commentaries, by John of Jandun in his *De sensu* commentary, to which I now turn.

4.2. John of Jandun on *Minima sensibilia*

4.2.1. John of Jandun: A Dispositional Account of Sensible Qualities

John of Jandun is the author of the discussion of the issue of *minima sensibilia* which is, probably, the most extended one by a Medieval Latin commentator, and also the only one to have been analysed in its own right in secondary literature[808]. Jandun's question commentary on the *De sensu*, which is preserved in five manuscript witnesses[809] and which has been edited in various early modern printed editions[810], can be dated,

[808] ROBERT, "John of Jandun on *Minima Sensibilia*", *op. cit.* However, my discussion is largely complementary to it, since the topics covered by Robert are largely distinct from (yet closely connected to) the ones that I will discuss in this section. Moreover, my presentation aims especially to connect Jandun's discussion to the previous and contemporary Latin commentary tradition on the issue of *minima sensibilia*, as analysed in the previous chapter and in the present one.

[809] The manuscript witnesses are the following ones (I provide more details in the Appendix to the thesis):

- Ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 6768 (14th century, quoting as date of the course AD 1309), ff. 100r-122v.
- MS. Oxford, Bodleian Library, Canon. Misc., lat. 222 (AD 1421), ff. 1-38 (anonymous).
- Ms. Sevilla, Biblioteca Capitular y Colombina, 7-7-19 (15th century), ff. 37r-72r.
- Ms. Venezia, Biblioteca Nazionale Marciana, Lat. VI.82 (Valentinelli 3019) (15th century), ff. 1r-35r (anonymous).
- Ms. Venezia, Biblioteca Nazionale Marciana, Lat. Z.259 (Valentinelli 1756) (15th century), ff. 217v-266v (incomplete).

A list of *quaestiones* of the whole commentary is provided in EBBESEN, THOMSEN THÖRNQVIST, DECAIX, "Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue", *op. cit.*, pp. 80-82. Note that q. 7 of the commentary, *Utrum omnis surdus a nativitate sit mutus*, has been critically edited in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 178-183, only by making use, however, of ms. Oxford, Bodl. L., Canon. Misc., lat. 222, ff. 1-38 and of the text printed in the 1557 edition (whose references are provided in the following footnote). Q. 33 (*Utrum unus sensus possit simul apprehendere sensibilia diversorum sensuum genere*), and q. 34 (*Utrum unus sensus percipiat contraria vel sensibilia diversorum generum sub unica actione*) of the commentary have been edited (based on all the manuscripts, save for Venezia, Biblioteca Nazionale Marciana, Lat. VI.82) in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 199-208.

[810] For the quotations in this chapter, I make use of the following one, which has been checked against all the known manuscript witnesses of Jandun's *De sensu* commentary: IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato* (*Quaestiones super Parvis nNaturalibus*), Venetiis, apud Hyeronimum Scotum, 1557. This edition reports also the marginal notes and remarks added to the text by Marcantonio Zimara (ca. 1470-ca. 1532), philosopher and physician active at Padua, Salerno and Naples in the early 16th century,

thanks to the date reported in the *colophon* of one of its manuscript witnesses, namely, ms. Vat. Lat. 6768, to 1309. The commentary devotes three *quaestiones* to the issue of *minima sensibilia*, namely q. 28 (*Utrum qualitates sensibiles sint divisibiles in infinitum*), q. 29 (*Utrum possit esse aliquid sensibile in actu quod non possit sentiri*), and q. 30 (*Utrum sit possibile esse in rerum natura aliquod corpus habens qualitatem primam aut secundam sub ita parva quantitate quod non possit secundum se sentiri manens sub illa quantitate*). While the first *quaestio* is, obviously, the traditional one, the two following *quaestiones* (which are strictly interconnected) both concern the issue that has been at the centre of the previous section of the chapter, namely, the possibility (as a mere conceptual hypothesis) of the existence on their own of sensible qualities that are not perceptible in act, which is exactly the topic of q. 29 of Jandun's commentary, and, correlatively, the question of whether this possibility is also a reality in the actual world, a question to which Jandun devotes q. 30 of his commentary.

Q. 28 discusses the issue of *minima sensibilia* without making reference to the possibility of the existence on their own of sensible qualities that are not perceptible in act. Therefore, its focus is "merely" on presenting the Aristotelian doctrine of *minima sensibilia*, according to which sensible qualities are infinitely divisible *per accidens* by an imaginative division (what Jandun explicitly calls *divisio secundum imaginationem*) in parts that exist within a given sensible whole and that are potentially perceptible in the first meaning, whereas sensible qualities are not infinitely divisible *per accidens* through the real separation of the parts of a given sensible whole from it (the parts existing in this way being, evidently, the ones that are potentially perceptible in the second meaning). Even though this is, therefore, the more "traditional" of the three *quaestiones*, Jandun is

who prepared the *editio princeps* of Jandun's *Quaestiones super Parvis Naturalibus* in 1505. On the reasons and character of Zimara's intervention, see B. NARDI, "Marcantonio e Teofilo Zimara: Due filosofi galatinesi del Cinquecento", *Archivio Storico Pugliese* VIII (III), 1955, pp. 121-159, reprinted, with important modifications, in ID., *Saggi sull'aristotelismo padovano dal secolo XIV al XVI (Università degli Studi di Padova – Studi sulla tradizione aristotelica nel Veneto 1)*, Firenze, Sansoni, 1958, pp. 321-364, p. 327: "Nello stesso anno in cui curò l'edizione della *Metafisica* dell'averroista di Jandun [i.e., 1505], ne preparò altresì quella delle *Quaestiones super Parvis Naturalibus*, per lo stesso editore veneziano, dedicandola a Bartolomeo Montagnana, iunior, professore di medicina nello Studio patavino e appartenente a una celebre famiglia di medici padovani. La qual dedica m'indurrebbe quasi a sosoettare, che egli si stesse preparando al dottorando in medicina, adulando con lodi sperticate, come era d'uso, un membro del « Sacro Collegio degli Aristi e Medici », che aveva il diritto di farsi « promotore » della « grazia », del « tentativo » e infine dell' « esame privato », nonché quello di conferire le insegne dottorali al candidato."

rather innovative in various aspects of his presentation[811]. First of all, he corrects the commentators analysed in the previous section (and also Alexander, from which they depended in this respect) on an issue to which I have frequently referred, namely, the superposition of the division of a continuous entity in equal and unequal parts and that of sensible qualities in parts existing on their own separately from the whole to which they belong and parts existing only as parts of their whole, respectively. Jandun, indeed, correctly remarks that the superposition of the two distinctions is wrong. Indeed, insofar as the division of a continuous entity in equal parts is *always* finite, it simply does not give rise to any issue concerning (potential) infinite divisibility. Therefore, if the sensible qualities of a given sensible whole are divided *per accidens* in equal parts (be the division a real process of separation or a merely imaginative one), they will certainly not be (potentially) infinitely divisible. On the contrary, the issue of their (potential) infinite divisibility *per accidens* only arises when the sensible whole to which they belong is divided in unequal parts. Therefore, both the imaginative division of a sensible whole in parts only existing within it, and the real separation of sensible parts from it, only raise

[811] Some of them are, however, of no particular significance for the present thesis (and will therefore be disregarded), insofar as they merely try to connect new aspects to the discussion of *minima sensibilia* which are, however, not related with it. In particular, Jandun's discussion of the issue of the infinite divisibility *per se* of sensible qualities (what he usefully terms that of their division *in partes subiectivas*, whereas the issue of the infinite divisibility *per accidens* is what he terms as that of their division *in partes quantitativas*) is particularly rich. Jandun, indeed, first of all provides a version of Alexander's argument concerning unequal infinites in this respect, in addition to Aristotle's argument, in a formulation which is slightly different than Brito's one. Cf. IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 28, Venetiis 1557 f. 19ra: "Item [i.e., that sensible qualities are not infinitely divisible *per se*], probatur rationibus Alexandri, quia si species qualitatum sensibilium essent infinitae, tunc unum infinitum esset maius altero, quia numerus individuorum est maior numero specierum, cum species, ut in pluribus, habeant multo plura individua, <ergo> esset dare maiorem numerum infinito. Hoc autem est impossibile, quia infinito nihil est maius. Item, plura infinita simul sunt plura vel essent, quod est impossibile, quia si essent plura unum finitaret alterum; consequentia patet, quia et species essent infinitae secundum se, et individua ipsarum, quod est impossibile"). Secondly, he also discusses whether the species of sensible qualities are infinite insofar as they are instantiated in individuals existing at the same time and, correlatively, in successive individuals (cf. especially IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 28, Venetiis 1557, f. 19va: "Et potest addi ad quaestionem, quod passiones naturales non sunt divisibiles in infinitum in partes subiectivas quae sunt individua simul et semel existentia, quia tunc cum passiones sint aliqua corpora, simul essent infinita corpora, quod improbatum est tertio *Physicorum*, sed sunt bene divisibiles in infinitas partes subiectivas, quae sunt individua succedentia sibi, quia illud cuius generatio perpetuatur, multiplicatur per individua infinita sibi succedentia. Si enim individua essent finita, tunc ad ultimum terminaretur et finiretur generatio. Nunc autem generatio sensibilium qualitatum perpetuatur, et ideo oportet, quod dividantur in infinitum quantum ad individua successive existentia"). No other Medieval Latin *De sensu* commentator, to my knowledge, mentions this issue while discussing *De sensu* 6, 445b3-446a20.

the issue of the (potential) infinite divisibility of sensible qualities insofas as such division is in unequal parts[812].

When, moreover, Jandun has to present Aristotle's doctrine of *minima sensibilia*, additional important elements emerge. Let us first of all quote the passage as a whole:

> Secondly [after having stated that sensible qualities are not infinitely divisible *per accidens* according to the division of a sensible whole in equal parts] I say that the division of sensible qualities concerning parts in act, i.e., [parts that] when they are separate [from the whole to which they belong] can participate to the form of the whole does not go on to infinity, because where there is to posit a *maximum* and a *minimum* the process of division is not infinite; indeed, once the *minimum* has been reached, the division stops; if it were otherwise, there would be to posit [something] smaller than the *minimum*, but in natural qualities there is to posit a *maximum* and a *minimum*, because they are certain natural forms having a determinate operation (*quaedam formae naturales determinatam operationem habentes*), which [they] cannot perform properly under any quantity. Thirdly, I say that concerning the potential parts, i.e. [the parts] which are in a whole and one is outside of the other, and one is not the other, [sensible qualities] are divided to infinity, and this division is according to imagination, because similarly are divided natural passions, such as the bodies [that are] their subjects, or a continuous entity. Indeed, it appears that a continuous entity is divided to infinity concerning such parts [i.e., unequal parts potentially existing in it], because it is divisible in [parts that are] always divisible, and otherwise it would be composed of individible entities, which has been refuted in *Physics* VI[813].

The two parts of the passage correspond to what, by the turn of the century, had already become (at least at the Parisian Faculty of Arts) the traditional way of presenting Aristotle's doctrine of *minima sensibilia*, as seen in the previous section. Moreover, when explaining that, according to Aristotle, the sensible qualities of portions of matter existing

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[812] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 28, Venetiis 1557, f. 19va: "Tertio [dico] quod (sc. passiones sensibiles) non sunt divisibiles in infinitum quantum ad partes quantitativas eiusdem quantitatis. [...] Quinto, quod non sunt divisibiles in infinitum quantum ad partes eiusdem proportionis seorsum subsistere potentes, et divisim formam totius participantes. Sexto, quod passiones naturales sunt divisibiles in infinitum in partes eiusdem proportionis, quae sunt partes solum in potentia, et non potentes seorsum et divisim participare formam totius, et omnes illae conclusiones demonstratae sunt per dicta."

[813] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 28, Venetiis 1557, f. 19ra-b: "Secundo dico, quod divisio qualitatum sensibilium quantum ad partes in actu, quae scilicet separatae possunt participare formam totius, non vadit in infinitum, quia ubi est dare maximum et minimum non est processus divisionis in infinitum; nam pervento ad minimum stat divisio; si aliter esset, esset dare minus minimo; sed in qualitatibus naturalibus est dare maximum et minimum, quia sunt quaedam formae naturales determinatam operationem habentes, quam non possunt bene exercere sub quantacunque quantitate. Tertio dico, quod quantum ad partes potentiales dividuntur in infinitum, scilicet quae sunt in toto et una est extra aliam, et una non est alia; et haec divisio est secundum imaginationem, quia similiter dividuntur naturales passiones, sicut corpora eis subiecta, sive continuum, constat autem quod continuum dividitur in infinitum quantum ad tales partes, quia est divisibile in semper divisibila; et aliter esset compositum ex indivisibilibus, quod improbatum est 6 *Physicorum*."

separately from the whole to which they belong are not (potentially) infinitely divisible *per accidens*, just like such portions of matter are not either, Jandun adduces the same basic argument already used by all the three commentators discussed in the previous section. Jandun, indeed, appeals to the existence of *maxima* and *minima* in material substances (i.e., of *maxima naturalia* and *minima naturalia* respectively), something which, again, had already become customary in discussions of *minima sensibilia* at the turn of the century at the Parisian Faculty of Arts (and also something that testifies to the fact that also Jandun directly connects the debate on *minima sensibilia* to that on *minima naturalia*, although he does not quote explicitly the text of *Physics* I.4 at this point, such as Brito, for instance, did). More specifically, as the commentators analysed in the previous section, Jandun claims that the existence of *minima naturalia* in material substances depends on the fact that substantial forms require a certain quantity of matter in order to perform their proper operation, and they cannot inform portions of matter smaller than the smallest one in which they can perform their proper operation. He evidently takes this theoretical acquisition for granted in this context, and this is the reason why he can adduce it in support of Aristotle's doctrine of *minima sensibilia* (especially for what concerns the sensible qualities of the parts of a sensible whole existing separately from it). Nevertheless, as I have shown in Chapter 2, this aspect is discussed at length by Jandun in the course of his commentary on *Physics* I.4, where he basically presents the same doctrine of *minima naturalia* put forth by Brito and whose central element has just been recalled[814].

Nevertheless, an aspect that immediately distinguishes Jandun from the commentators discussed in the previous section is that he does not mention, in this context, the corrupting action of the containing medium as a second argument grounding the existence of maxima and minima in material substances. As the unfolding of this section will show, the role of the contianing medium is severely limited in Jandun's discussion of *minima sensibilia*, and this for a fundamental reason that I will detail in a moment.

Before getting to this point, however, there is another aspect to underline in q. 28 of Jandun's commentary. Indeed, in the *responsio ad rationes*, Jandun provides an

[814] Moreover, for what concerns this aspect, the overall discussion of Jandun's metaphysics of causal powers, in relation with issues of *maxima* and *minima* in nature, ROBERT, "John of Jandun on *Minima Sensibilia*", *op. cit.*, constitutes an excellent overview.

interesting discussion of Aristotle's argument against the infinite divisibility *per accidens* of sensible qualities, namely, the one according to which if sensible qualities were (potentially) infinitely divisible *per accidens*, so the sensory powers required to perceive them should be augmented to infinity, something which is inadmissible. Jandun, quoting Aquinas' discussion of Aristotle's remark at 446a10-15, affirms that it is absurd to assume, as Aquinas does, that if the sensible qualities of portions of matter existing on their own were infinitely divisible, still sensory powers would not be. Indeed, Jandun remarks, "[…] that is really marvelous, that the sensible will be called [such] with respect to sense, and still posited one [as divisible to infinity in parts existing on their own] the other will not be so (*[...] sed illud est vale mirabile, quod sensibile dicatur ad sensum, et tamen posito uno non ponatur alterum*)[815]." The passage is rather bizarre, insofar as it interprets Aquinas' discussion exactly in the opposite way as the one in which I have interpreted it. Indeed, as I have remarked in the previous chapter, due to his willingness to avoid any "corpuscularian" implication of Aristotle's remark at 446a10-15, Aquinas is ready to admit that, if the sensible qualities of portions of matter existing on their own were infinitely divisible, it should also be admitted that there is a sensory power capable of perceiving them (at the limit, a sensory power of infinite strength). In this sense, therefore, Jandun seems to be claiming exactly what Aquinas had claimed. Nevertheless, as I will show below, while Aquinas made this claim in order to avoid any "corpuscularian" implication of Aristotle's remark at 446a10-15 and also, correspondingly, to preserve the Aristotelian principle of the coextension of the sensible world and of the perceptible one, Jandun has a different worry in mind. For him, indeed, what is really problematic to accept is that, if a sensible quality is understood as that which has the power to act on the senses, then there cannot be a sensible quality existing on its own which does not have the power to act on the senses, and to which, therefore, does not correspond a sensory power capable of perceiving it:

[815] Here is Jandun's full passage: "Ad rationes alterius partes: ad primam, tu dicis quod virtus sensitiva augmentaretur in infinitum, si sensibile divideretur in infinitum. Expositor exponendo illam partem, *Quinimmo nam sensus superabundantia* [*De sensu* 6, 446a10-13] dicit quod cum virtus sensitiva sit finiti vigoris, dato quod sensibile divideretur in infinitum etiam in partes remanentes, ut dicit, non sequeretur superabundantia sensus, sed illud est vale mirabile, quod sensibile dicatur ad sensum, et tamen posito uno non ponatur alterum" (IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 28, Venetiis 1557, f. 19rb).

> Moreover, to an active potency always corresponds a passive [one], and the sensible has an active potency with regard to sensation, and therefore, given a sensible of any smallness whatsoever, if it is truly sensible, it will appear that to it corresponds a sense, and mainly if it is a sensible existing on its own. Moreover, that sensible, which you say cannot be perceived, will have a useless potentiality (*potentiam ociosam*), because it will never be perceived, and therefore it will not appear to be entirely unfounded to deny that proposition, [i.e.,] that if the sensible were divided to infinity in parts exceeding in smallness [existing] on their own, the sense will not be augmented to infinity, and it does not hold the argument [in its support, namely, that no power in the natural world can be infinite in strength]. Indeed, even though the sense is, simply and absolutely, of a finite strength, still once something impossible [i.e., the fact that the portions of matter of a sensible whole existing on their own can be infinitely divided] has been posited, it can follow as a necessary [consequence] that it [i.e., the sense] is of infinite strength[816].

Jandun's reasoning in this passage takes into account one of the aspects that have already emerged in the preceding section, namely, that of the need to consider, while discussing the issue of *minima sensibilia*, and especially the issue of the sensible qualities of portions of matter existing separately from the whole to which they belong, the *relational* nature of sensible qualities. This was especially the case of the commentary of ms. Vat. Lat. 2170, but also, to a lesser extent, of the commentary of ms. Vat. Lat. 3061. Nevertheless, the author of those previous commentaries explicitly accepted that, in some cases, it can be perfectly acceptable that a sensible quality, as an *activum in potentia*, to use the terminology of the commentary of ms. Vat. Lat. 2170, exists on its own without the actual existence of a corresponding *passivum in potentia*. Jandun, on the contrary, takes the opposite position. His reasoning in this passage seems to be that if a sensible quality (one which is *vere sensibile*, Jandun insists) exists on its own in a given portion of matter, then it must be perceptible in act, that is, it must possess the power to act on the senses, and so there must be a corresponding sensory power capable of perceiving it. Jandun's worry, therefore, seems to be that if a sensible quality is defined by its power to act on the corresponding sense, it cannot be posited that it exists on its own without having the power to perform the proper operation of acting on the sense. This, as I will show below,

[816] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 28, Venetiis 1557, f. 19rb: "Item, potentiae activae semper respondet passiva, et sensibile habet potentiam activam respectu sensationis, et ideo quantocunque sensibili parvo dato, si sit vere sensibile, videtur quod ei respondeat sensus et praecipue si sit sensibile seorsum existens. Item, illud sensibile, quod dicis non posse sentiri, habebit potentiam ociosam, quia nunquam sentietur, et ideo non videtur omnino tutum, negare illam propositionem, quod si sensibile divideretur in infinitum in partes superabundantes in parvitate seorsum, quin sensus augmentaretur in infinitum, nec valet ratio eius. Quamvis enim sensus sit simpliciter et absolute finiti vigoris, tamen aliquo impossibili posito, posset sequi necessario ipsum esse infiniti vigoris."

represents the fundamental point around which Jandun's discussion of *minima sensibilia* (as the discussion of the commentators analysed in the previous section) centres. It is nevertheless remarkable, be it said incidentally, that, although for different reasons, Jandun in this way arrives to affirm what Aquinas had previously claimed (*pace* what Jandun says), namely, that, once it has been posited the infinite divisibility of the sensible qualities in portions of matter existing on their own, something impossible in nature, then there is no problem in admitting something else which is impossible, namely, the existence of a sensory power of infinite strength. It is indeed this exact argument, as I have shown above, that grounded Aquinas' reasoning in commenting upon *De sensu* 6, 446a10-15.

If, indeed, this were the conclusion of Jandun's discussion of *minima sensibilia*, his position, although founded upon different grounds, would appear to be remarkably close to Aquinas' one, at least insofar as Jandun, such as Aquinas (and Auvergne) would be a strong supporter of the principle of the coextension of the sensible world and of the perceptible one. Nevertheless, Jandun is fully inserted into the debate that was taking place at the Parisian Faculty of Arts since the turn of the century, and, as such, he is fully aware of the fact that commentators such as those analysed in the previous section had explicitly assumed, under the influence of a new conception of the process of substantial change (that there is no evidence, however, to claim that also Jandun shared – quite the contrary, indeed, as already seen in Chapter 2), the existence on their own of sensible qualities that are not perceptible in act, and had also taken this to be the correct interpretation of Alexander's commentary.

This is the reason why, after having reasserted that the correct interpretation of Aristotle's doctrine (established also with explicit recourse to Alexander's commentary) is that according to which the parts of a sensible whole existing separately from the whole to which they belong are not infinitely divisible, and, especially, they are not divisible below the threshold of perceptibility in act, Jandun starts to challenge this doctrine, by making an explicit appeal to Alexander's commentary. At the same time, however, Jandun also foreshadows the idea that, as it will be clear below, grounds his own acceptance of the existence on their own of sensible qualities that are not perceptible in act, as I will explain in a moment:

> If, however, there is something sensible existing on its own that cannot be perceived in act, such as Alexander's words appear to pretend, we will discuss about this below [i.e., in q. 29 and, especially, in q. 30]. To the other [Aristotelian argument in favour of the infinite divisibility *per accidens* of sensible qualities, namely, that if sensible qualities were not infinitely divisible *per accidens* sensible entities would be composed of non-sensible ones] it can be said now that there is no body which is entirely insensible due to its smallness, talking about the sensible by itself and subsisting on its own; however, there are in a [sensible] whole such parts so small that [they] cannot be perceived by themselves and on their own, instead are only perceived insofar as they are in the whole, and if they were separated from the whole they would not be perceived by themselves, because they would not subsist by themselves; indeed, they would be corrupted by the containing [medium], such as Aristotle says that a minimal flavour etc. And if it is so understood that there is something [existing] on its own which is not perceptible (*insensibile*) due to its smallness, it would well be true. However, if it is understood that some body existing on its own is not sensible in any way (*insensibile omnibus modis*) due to its smallness, maybe it must not be accepted[817].

Firstly, Jandun notes, it clearly appears from Alexander's commentary that he believes in the existence of sensible qualities existing on their own without being perceptible in act, although Jandun postpones the discussion of this issue to q. 29 and, especially, to q. 30. This is already a significant statement, however, since Jandun clearly takes Alexander's opinion to concern not a thought experiment related to a possible world where there is no corrupting action of the containing medium, but (probably under the influence of the commentators analysed in the previous sections, or of others holding analogous positions) as an opinion regarding the actual world. Secondly, after having referred to the process of corruption by the containing medium appealed to by Aristotle at 446a7-10, Jandun introduces an extremely interesting distinction between a body that is *insensibile* and one which is *insensibile omnibus modis*. It is rather clear that, assuming that Jandun is not adopting a temporally extended conception of substantial change, as already seen in Chapter 2, and as it will be also illustrated below (nothing, moreover, in the passage suggests adopting this interpretation), then the two expressions do not refer to the parts of a sensible entity that are undergoing a process of corruption. How, then, can the

[817] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 28, Venetiis 1557, f. 20rb-va: "Utrum autem sit aliquod sensibile seorsum existens quod non possit actu sentiri, sicut videntur praetendere verba Alexandri, de hoc postea inquiretur. Ad aliud potest dici ad praesens quod nullum est corpus insensibile omnino propter suam parvitatem, loquendo de sensibili per se et seorsum subsistente, tamen aliquae partes sunt in toto ita parvae quod non possunt sentiri secundum se et seorsum, immo solum sentiuntur ut sunt in toto, et si dimitterentur a toto non sentirentur secundum se, quia nec per se subsisterent. Immo resolverentur in continens, ut Aristoteles dicit quod minimus sapor etcet. Et si sic intelligatur aliquid esse seorsum insensibile propter parvitatem, bene est verum. Si autem intelligatur quod aliquod corpus seorsum existens sit insensibile omnibus modis propter parvitatem, forte non est concedendum."

distinction be understood? My idea is that here Jandun is already hinting at the model that he will develop more fully in q. 29 and, especially, in q. 30 of his *De sensu* commentary, namely, a model according to which the threshold of corruptibility of sensible qualities is lower than the threshold of their perceptibility, and where, therefore, it is well possible in the actual world that a sensible quality can exist on its own united to a portion of matter too small to be perceptible in act without being corrupted by the containing medium, provided that the portion of matter is in a sufficient quantity to resist to the action of the medium (not, however, in a quantity sufficient to warrant perceptibility in act). In this way, any sensible qualitiy existing on its own united to a portion of matter falling within the "size-range" between the threshold of corruptibility and the threshold of perceptibility would be an *insensibile*, that is, a sensible quality that is not perceptible in act. Still, such a sensible quality would not be an *insensibile omnibus modis* insofar as, according to what Jandun will explain in q. 29 and especially in q. 30 of his commentary, such a sensible quality can become perceptible in act, according to Jandun's interpretation of the third meaning of potentially perceptible, by uniting to a sufficient quantity of sensible qualities existing under the same condition. This model also perfectly explains why Jandun is so little interested, in his discussion of *minima sensibilia*, to the role of the containing medium. If, indeed, sensible qualities that are not perceptible in act exist in the actual world regardless of the corrupting action of the containing medium, then there is no reason to focus the attention on the role of the medium itself while analysing such qualities.

As a result of this new conceptual framework, the position that Jandun goes on to develop in q. 29 and in q. 30 concerning sensible qualities existing on their own without being perceptible in act is significantly different from and much richer than those adopted by the commentators analysed in the previous section (and Jandun will explicitly declare the originality of his proposal). Still, Jandun is also very conscious of the difficulty entailed by the position he is proposing. Indeed, the *quaestio* perfectly shows how Jandun is torn between the need to admit the existence on their own of sensible qualities that are not perceptible in act and the opposing need, which apparently seems to be the same felt by Aquinas, to preserve the power of any sensible quality existing in act to act on the external senses, if (and this conditional clause is what fundamentally distinguishes Jandun from Aquinas in this respect) the power to perform its essential operation is taken to be a

necessary condition for the essence of a sensible quality to exist in a given portion of matter.

This tension is what lies at the heart of q. 29 of Jandun's commentary, where the commentator goes on to discuss the conceptual possibility of conceiving sensible qualities existing on their own without being perceptible in act, before considering, in q. 30, whether there can be such sensible qualities in the actual world. The tension is already evident from the arguments adduced in favour and against the possibility of the existence on their own of sensible qualities that are not perceptible in act, at the beginning of q. 29. Among the arguments in favour, Jandun inserts two arguments that are quite closely related to the debate taking place at the Parisian Faculty of Arts since the turn of the century and analysed in the previous section. The first is the following one:

> Moreover, the first act can be without the second act, such as science without consideration, such as it appears from *De anima* II. But the sensible is the first act concerning perception, therefore the sensible can exist without that it is ever perceived[818].

The argument clearly distinguishes between a first act of sensible qualities, that of their existence on their own, and a second one, that is the one of acting on the senses. The distinction comes very close to the distinction made in the commentary of ms. Vat. Lat. 2170 between the possession by sensible qualities of a *principium motivum sensibilitatis* (taken as their first act) and that of the *actum sensibile* (taken as their second act). Still, it must also be remarked that Jandun's reference to science as a property that can be possessed even when it is not exercised in act, although Jandun takes his example from *De anima* II, seems to bring back to mind (although within a completely different conceptual framework) Bacon's discussion of the *risibilitas* of man, and also his discussion of the *virtus gressibilis*, two properties that, in his analysis, played a role extremely close to the one that the *scientia* plays in Jandun's passage.

Nevertheless, the argument adduced by Jandun immediately after is, instead, more clearly indebted to the doctrine adopted by the commentators analysed in the previous section:

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[818] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 19va: "Item, actus primus potest esse sine actu secundo, ut scientia sine considerare, ut patet secundo *De anima*. Sed sensibile est actus primus respectu sentire, ergo sensibile potest esse absque eo quod unquam sentiatur."

> Moreover, in any case in which there is something born to perform a certain action under a determined quantity (*sub determinata quantitate*), the same can be so small that it will not be capable of that action. Indeed, to the action is required a sufficient quantity such as a form, such as Averroes intends in *Physics* VIII. But the sensible was born to act on the sense under a determined quantity, therefore it will be possible that there is a sensible in act so small that it does not act, and so it cannot be perceived[819].

The argument is unmistakably based on the discussion conducted by commentators such as those analysed in the previous section, who advanced the idea that the proper operation of entities in nature can only be performed when the form performing it is present in a sufficient quantity of matter. The idea that the quantity of matter required for a form to perform its proper operation is greater than the one required for it to exist within a certain matter is explicitly stated, as I have shown, in the commentary of ms. Vat. Lat. 3061. There, however, the *auctoritas* adduced in support of such a view was the Aristotelian one of *De caelo* I. Jandun, however, chooses to ground his argument on an *auctoritas* from Averroes' *Long Commentary* on *Physics* VIII. This is in itself an interesting choice, since, as I will now show, Averroes' role in Jandun's discussion, from this point onwards, becomes paramount. This is certainly due, among other factors, to the importance that Averroes' thought in general plays in Jandun's reasoning, in natural philosophy as in so many other domains. In this sense, it is also possible to affirm that Jandun's discussion of *minima sensibilia* marks a powerful comeback into the debate for Averroes. Indeed, given the absence of an Averroistic doctrine of *minima sensibilia*, previous commentators had largely disregarded Averroes in their discussion. Jandun, instead, overcomes the lack of a discussion of *minima sensibilia* in Averroes' *Epitome* on the *Parva naturalia* by creatively connecting passages taken from various other works of Averroes to the debate at hand (a practice that, as I have shown in the previous chapters, found some partial precedents at least in the Pseudo-Siger's commentary on *Physics* I.4 and in Peter of Auvergne's commentary on *De sensu* 6). This approach will, as I will show below, be present also (even though to a much lesser extent) in the commentators closest to Jandun

[819] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 19va-b: "Item, quandocunque est aliquid natum agere aliquam actionem sub determinata quantitate, ipsum potest esse ita parvum quod non poterit in illam actionem. Nam ad actionem requiritur debita quantitas sicut forma, ut vult Averroes in octavo *Physicorum*. Sed sensibile est natum agere in sensum sub determinata quantitate, ergo poterit esse sensibile in actu ita parvum quod non aget, neque poterit agere in sensum, et sic non poterit sentiri."

and part of the debate on *minima sensibilia* taking place at the Parisian Faculty of Arts around 1310, such as the anonymous commentator of ms. BnF Lat. 16160, and in those influenced by such debate, such as the anonymous commentator of ms. Oriel 33.

Averroes' influence becomes even more evident when Jandun comes to the arguments against the idea that sensible qualities can exist on their own without being perceptible in act in the actual world. The only argument adduced in this respect, indeed, comes from Averroes' *Long Commentary* on *Metaphysics* Θ:

> Against [i.e., the existence on their own of sensible qualities that are not perceptible in act] it is argued because, if there were something sensible that cannot move the sense and [that] cannot be perceived, then something sensible would not be sensible, because [he] who takes away the operation, takes away the essence (*qui tollit operationem, tollit essentiam*), such as Averroes says in *Metaphysics* IX. However, the operation of the sensible is [that of] moving the sense and being perceived, therefore once it [i.e., the sensible] cannot move the sense, it will not have the nature of a sensible, and so it will be sensible and not sensible, which is impossible[820].

This is the same argument that had been used by the Pseudo-Siger in his discussion of *minima naturalia*, and that, as I anticipated in Chapter 2, would come to play a prominent role in the early 14th-century debate on *minima sensibilia* at the Parisian Faculty of Arts[821]. The passage, which it seems now worth quoting in full, comes from Averroes' commentary on *Metaphysics* Θ.3[822], and it is part of a wider polemics conducted by Averroes against Ash'arite occasionalism, according to which the only proper causal agent in the world is God, since no creature can possess the power to perform its actions

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[820] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 19vb: "Oppositum arguitur, quia si esset aliquod sensibile quod non posset movere sensum neque sentiri, tunc aliquod sensibile non esset sensibile, quia qui tollit operationem tollit essentiam, ut dicit Commentator nono *Metaphysicae*. Operatio autem sensibilis est movere sensum et sentiri, ergo non potente ipso movere sensum, non habebit naturam sensibilis, et sic erit sensibile et non sensibile, quod est impossibile."

[821] Of course, the reception of this argument in the Latin West goes far beyond the debate on *minima*. Evidently, indeed, this argument was first and foremost used by Medieval Latin commentators in more obvious "metaphysical" contexts, such as Siger of Brabant's commentary on the *Liber de causis*, but also (later) theological *Quodlibeta*. Cf., respectively, D. CALMA, Sine secundaria: *Thomas d'Aquin, Siger de Brabant et les débats sur l'occasionalisme*, in ID. (ed.), *Reading Proclus and the* Book of Causes. *Vol. 1: Western Scholarly Networks and Debates (Studies in Platonism, Neoplatonism, and the Platonic Tradition 22)*, Leiden, Brill, 2019, pp. 268-300, and I. SZÉKELY, *The* Liber de causis *in Some Central European Quodlibets*, in CALMA (ed.), *Reading Proclus and the* Book of Causes. *Vol. 1: Western Scholarly Networks and Debates*, *op. cit*., pp. 301-323.

[822] In the *editio Juntina II* this argument is part of the commentary on what is identified as the fourth chapter of *Metaphysics* Θ, since the edition splits the text of what, in the Bekker edition, is Θ.1 in two separate chapters.

before it performs them[823]. More precisely, according to Ash'arite occasionalism, any time that a created entity performs an action, God creates the power through which the action is performed, and He infuses it in the entity that performs it, so that the only true subject to which the action can be meaningfully attributed is God Himself, which, as a result, becomes the only causal agent in the world[824]. Averroes objects to this view in the passage under discussion in the following way:

> The modern [theologians], however, posit a single one that causes all things without intermediaries (*sine medio*), i.e., God. And they are [therefore] forced to accept that no [created] entity has [its] proper action naturally. And, since entities will not have proper actions, they will not have proper essences. Actions, indeed, are not distinguished if not through the diversity of essences (*Actiones nam non diversantur nisi per essentias diversas*). And this opinion [i.e., that of modern theologians] is completely extraneous to the nature of man, and those who adopt it do not have a properly functioning brain[825].

Averroes' objection to Ash'arite occasionalism is based exactly on the idea that if an entity does not have the power to perform its proper action, it will automatically lose its essence. If, then, no created entity has the power to perform its proper operation, then there will be no different essences in the world, something which is utterly absurd.

Although Averroes' argument had already been used in the Medieval Latin debate on *minima naturalia* before Jandun (yet not in the Medieval Latin debate on *minima sensibilia*), the role that the argument takes on in Jandun's commentary is unprecedented.

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[823] On Ash'arite occasionalism, see M. FAKHRY, *Islamic Occasionalism and its Critique by Averroes and Aquinas*, London, Allen & Unwin, 1958, R. M. FRANK, "The Structure of Created Causality according to al-Ash'ari", *Studia Islamica 25*, 1966, pp. 13-76 and, more recently, D. PERLER, U. RUDOLPH (eds.), *Occasionalismus. Theorien der Kausalität im arabisch-islamischen und im europäischen Denken*, Göttingen, Vandenhoeck & Ruprecht, 2000 and R. M. FRANK, D. GUTAS, *Early Islamic Theology: The Mu'tazilites and al-Ash'ari. Texts and Studies on the Development and History of Kalam, Vol. II*, Routledge, London, 2007. To these texts, one should also add, as a useful introduction, R. SPECHT, *Occasionalismus*, in J. RITTER, K. GRÜNDER (eds.), *Historisches Wörterbuch der Philosophie (Band 6)*, Basel-Stuttgart, Schwabe & Co., 1984, pp. 1090-1091. Some important considerations on the origins of Islamic occasionalism can also be found in SORABJI, *Time, Creation, and the Continuum. Theories in Antiquity and the Early Middle Ages*, *op. cit.*, pp. 297-306.

[824] According to FRANK, "The Structure of Created Causality according to al-Ash'ari", *op. cit*., insofar as, in Ash'arite theology, causal powers are still attributed by God to creatures, rather than being exercised directly by God, sufficies to defend this position against the charge of representing an instance of "pure" occasionalism; this debate, unfortunately, cannot be dealt with further in the context of the thesis.

[825] AVERROES CORDUBENSIS, *Aristotelis Metaphiysicorum libri XIIII cum Averrois Cordubensis in eosdem commentariis et epitome, Theophrasti metpahysicorum liber*, Venetiis 1562, f. 231vH: "Moderni autem ponunt unum agens omnia entia sine medio, scilicet Deum. Et contingit istis, ut nullum ens habeat actionem propriam naturaliter. Et, cum entia non habuerint actiones proprias, non habebunt essentias proprias. Actiones nam non diversantur nisi per essentias diversas. Et ista opinio est valde extranea a natura hominis, et qui recipiunt huiusmodi [*rectius*: hoc], non habent cerebrum habilitatum naturaliter ad bonum."

Indeed, Jandun takes this argument to provide a decisive obstacle to any attempt to admit the existence on their own of sensible qualities that are not perceptible in act in the actual world and, as I will show, also as a mere conceptual possibility. As it was already partially evident from q. 28, Jandun (probably under the influence of this argument) takes the connection between the essence of sensible qualities and the power to perform their proper operation to be much more fundamental than the commentators analysed in the previous section did. In his view, if sensible qualities only have the power to perform their proper operation under a certain quantity, their essence cannot be the same when they exist being perceptible in act and when they exist without being perceptible in act. How, however, can two forms with a different essence be (numerically) the same thing? Jandun seems here to be faced with a dilemma. Either he denies that sensible qualities can exist on their own without being perceptible in act, or he denies that the essence of a form is lost when that form loses the power to perform its proper operation.

It certainly testifies to the importance that Averroes' argument has for Jandun that he first tries to take the first horn of the dilemma, that is, he tries to deny the existence on their own of sensible qualities that are not perceptible in act, against the (presumably) prevailing opinion, at his time, at the Parisian Faculty of Arts (which even went into the direction of admitting the existence of such sensible qualities in the actual world, as shown in the previous section). Jandun, more precisely, provides a sort of *excursus* of the positions of his predecessors concerning the existence on their own of sensible qualities that are not perceptible in act, where the position that emerges as prevailing is not that of his immediate predecessors at the Parisian Faculty of Arts, but rather the traditional Aristotelian one according to which the existence on their own of sensible qualities that are not perceptible in act is to be relegated to a possible world without the corrupting action of the containing medium. Then, Jandun goes on to present a set of arguments (which had become standard by his time) against the existence of sensible qualities that are not perceptible in act, even as a mere conceptual possibility. It is only at this point that Jandun provides his own solution to the dilemma, that avoids both of its horns.

Jandun introduces his *excursus* in the following way:

> Regarding this [i.e., the existence on their own of sensible qualities that are not perceptible in act] some say that the intention of Alexander and of all the expounders of Aristotle is that there is to posit some sensible existing on its own that cannot be perceived in act by itself. And the argument that [they] attribute to them is [the one]

> that has been mentioned, because the sensible was born to move the sense under a determined quantity, and therefore it can be so small that even though it has the nature of a sensible in act, however it cannot be perceived by itself due to its smallness, hence [these extremely small sensibles] lack the ability to move the sense, and [Alexander] adds, after a few words: "not, indeed, only in quality, but also in quantity of power...". These are the words through which it appears to me that that intention could be more attributed to him, since [he] denies that some parts are in the whole potentially perceptible, not because they could be perceived while existing in act [on their own], but because while existing in the whole they contribute something to the perception of that whole, and to [its] ability to move the sense in act, and [Alexander] says in another place that it does not follow, if some part separated [from the whole to which it belongs] is not perceptible by itself, i.e., [if] it is not perceived in act while existing by itself and separated [from the whole to which it belongs], that for this reason is not sensible and without a [sensible] quality, but [it] was potentially perceptible while existing on its own, [and it] was sensible in act instead uniting itself with other [parts]. And from all such words it is believed that it was Alexander's intention that there can be some sensible existing by itself and separate from the whole [to which it belongs] that, however, cannot be perceived, and similarly it appears that [this] was the intention of Albert and of Aquinas, but I do not want to quote their words (*sed nolo ponere verba eorum*)[826].

The passage is remarkable for many reasons, not the least of them being the fact that Jandun correctly summarises all the three meanings of 'potentially perceptible' present in Alexander's commentary (and in Aristotle's text), including the third meaning of potentially perceptible with its "corpuscularian" implications (something that the commentators discussed in the previous section did not refer to explicitly). Moreover, Jandun recognises for the first time in an explicit way that, starting from Alexander's own commentary, all Medieval Latin commentators (*omnium exponentium Aristotelis*, although, at the end of the passage, Jandun mentions by name Albert and Aquinas) had recognised that (in the absence of the corrupting medium, therefore as a conceptual

[826] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 19vb: "De hoc dicunt aliqui quod intentio Alexandri et omnium exponentium Aristotelis est quod sit dare aliquod sensibile seorsum existens, quod non potest actu secundum se sentiri. Et ratio quam eis attribuunt est quae tacta est, quia sensibile natum est movere sensum sub determinata quantitate, et ideo potest esse ita parvum, quod quamvis habeat actu naturam sensibilis, non tamen potest sentiri secundum se propter parvitatem, unde deficiunt ne possint (*fortasse pro*: nec possunt, cf. q. 30, *ad oppositum*) movere sensum, et subdit, paucis interpositis: "non enim in qualitate sola, sed in quantitate virtutis, quae a sensibili motus sit actu sensibilis". Haec sunt verba per quae videtur mihi quod illa intentio magis possit ei attribui, unde impedit quod aliquae partes sunt in toto sensibiles in potentia, non quod [quia] secundum se existentes possint actu sentiri, sed quia in toto existentes conferunt aliquid ad sensum illius totius, et ad posse movere secundum actum sensum, et dicit in alio loco quod non sequitur, si aliqua pars non secundum se est sensibilis separata, i.e. si non sentitur actu secundum se existens et separata, quod propter hoc sit insensibilis et sine passione, sed erat secundum se existens potentia sensibilis, actu autem sensibilis erat aliis superveniens. Ex quibus omnibus verbis creditur esse intentio Alexandri quod possit esse aliquod sensibile secundum se existens et separatum a toto, quod tamen non potest sentiri, et similiter videtur esse intentio Alberti et expositoris, sed nolo ponere verba eorum."

possibility, although Jandun does not say it explicitly here) it had been possible to admit the existence on their own of sensible qualities that are not perceptible in act.

Nevertheless, Jandun goes on to claim that the *aliqui* who attribute to Alexander and to all the other commentators of *De sensu* 6 the claim according to which sensible qualities can exist on their own without being perceptible in act (an interpretation of the position of these commentators that Jandun, as seen in the passage quoted, also shares), also provide a significant array of arguments against such a position. The interesting question to ask is, first of all, whether these *aliqui* correspond to some precisely identifiable commentators or not. The possibility of a concrete historical identification would be even more important by considering the fact that all the commentators whose position I have analysed until now (apart, ironically, from Aquinas, whose position is here again misunderstood by Jandun, Peter of Auvergne and Felmingham (?)) admit, at the very least, the conceptual possibility of the existence on their own of sensible qualities that cannot be perceptible in act. Was there, at Jandun's time or before, some other Latin *De sensu* commentator who explicitly rejected such a position? Lacking further textual evidence, I incline towards a negative answer. Here, indeed, I believe that Jandun is using the expression with the rhetorical (and structural) aim to gather together all the arguments that, in contemporary discussions of the issue, were commonly advanced to deny the possibility to admit the existence on their own of sensible qualities that are not perceptible in act.

The first of these arguments is the one according to which this is contrary to Aristotle's intention[827]. The second one is, instead, the one already seen in the commentary of ms. Vat. Lat. 2170, and, less prominently, in the commentary of ms. Vat. Lat. 3061 and in q. 28 of Jandun's own commentary. This is the argument according to which to any active potency must correspond a passive one, and since a sensible quality is an active potency with respect to its corresponding sense acting as the passive one, there cannot exist in act a sensible quality that is not perceptible in act[828].

[827] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 19vb: "Et tunc illa positio [i.e., that there are sensible qualities existing in act without being perceptible in act] vere improbatur ab esi qui attribuunt eam Alexandro et aliis. Primo, quia est contra intentiome Aristotelis, qui ponit quod nullum est tempus insensibile propter parvitatem, neque similiter magnitudo."

[828] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 19vb: "Item, omnis potentia activa refertur ad passivam, et una per alteram diffinitur, quinto Metaphysicae. Si ergo est aliquid habens potentiam activam in sensum, oportet quod sibi respondeat potentia passiva ex parte sensus,

After introducing these two arguments, Jandun presents the position of those who deny the possibility of the existence on their own of sensible qualities that are not perceptible in act (a position which, as I said above, would allow him to provide a doctrine of *minima sensibilia* in agreement with Averroes' argument). The presentation is divided by Jandun in three parts. First, Jandun remarks, the *aliqui* who deny the possibility of the existence on their own of sensible qualities that are not perceptible in act introduce a distinction between a sensible quality that is not *perceived* in act (for "extrinsic" reasons, such as the lack of a sense within a suitable distance from it) and one that is not *perceptible* in act (for the "intrinsic" reason of the smallness of the matter in which it exists). While it is of course fully acceptable to claim that a sensible quality, in some cases, is not perceived in act, it is an entirely different affair to claim that it is not perceptible in act. The consequence of this distinction, Jandun notes, is that the *aliqui* do not believe that the existence of sensible qualities depends on their actual perception, but only on their actual perceptibility. That is, sensible qualities exist even when they are "inactive" with respect to the senses, not, however, when they *cannot be* active in their regard[829]. Secondly, Jandun attributes to the *aliqui* an argument that is analogous to Averroes' argument, but that is based on an authority from Aristotle's *Metaphysics* B, and according to which it is impossible for something to be sensible (that is, to have the essence of a sensible) without being perceptible in act, that is, without having the power to perform its proper operation[830]. Finally, Jandun mentions an objection to the existence

et sic quandoque poterit sentiri, et sic falsum est quod dicunt [i.e., that there are sensible qualities existing in act without being perceptible in act]."

[829] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 20ra: "Tunc dicunt primo [i.e., the "aliqui" denying the existence in actuality of sensible qualities that are not perceptible ina ctuality] quod aliquod sensibile potest actu non sentiri, ita quod actu non sentiatur, quia sicut se habet intelligibile ad hoc quod actu intelligatur, sic sensibile ad hoc quod actu sentiatur. Et est satis uniformis comparatio. Sed possibile est, quod aliquod actu intelligibile non intelligatur actu, ut patet ex *Praedicamentis*. Quadratura enim circuli scibilis est, tamen scientia eius nondum est, et adiungunt quod sensibile non dependet in esse suo ab actuali sensatione, ergo sine actuali sensatione potest esse. Eodem modo dicunt quod non potest esse aliquod sensibile absque eo quod possit sentiri, quia quandocunque aliquid habet potentiam motivam et activam respectu sensus, ipsum potest sentiri et movere sensum sensu praesente et medio disposito; sed omne sensibile est huiusmodi, ergo etc." Note that the comparison of sensible qualities that are not perceived in actuality with the corresponding intelligible entity of the squaring of the circle is utterly mistaken: indeed, if anything, an intelligible object such as the squaring of the circle, that exists without being cognisable in act, is the exact analogue of a sensible quality that exists without being perceptible in act.

[830] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 20ra: "Item arguunt quod <si> est impossibile sentiri, impossibile est esse sensibile. Hoc patet tertio *Metaphysicorum*: si enim impossibile est esse sentiens, impossibile est ese sensibile secundum Aristotelem. Ergo per oppositum a destructione consequentis: si possibile est aliquid esse sensibile, possibile est ipsum sentiri, et sic non est aliquod sensibile in potentia quin possit sentiri."

on their own of sensible qualities that are not perceptible in act that had entered the debate on *minima sensibilia* very early, being already present, as I have shown, in Bacon's *Liber de sensu*. The objection concerns the fact that, if a sensible quality existed on its own without being perceptible in act, then it would exist without a purpose, and it is remarkable to see that, although without frequently emerging to the surface, such an objection seems to have been constantly present in the subsoil of the Medieval Latin debate on *minima sensibilia*[831].

The overall position of the *aliqui* who deny the possibility of the existence on their own of sensible qualities that are not perceptible in act is therefore characterised by Jandun, in a concluding passage, as a position according to which every sensible quality is always sensible, either as contributing to the perception in act of the whole to which it belongs (according to the first meaning of potentially perceptible) or by being sensible in act on its own separately from it (according to the second meaning of potentially perceptible). The sensible qualities associated with portions of matter too small to be perceptible in act on their own are, instead, corrupted by the containing medium (and the way in which the process of corruption is understood by the *aliqui* is, in this case without any doubt, as an instantaneous one). Moreover (although Jandun does not say it explicitly), the mere conceptual possibility of the existence on their own of sensible qualities that are not perceptible in act, in the absence of the corrupting action of the containing medium, is evidently firmly rejected by the *aliqui*.

After having presented the position of the *aliqui*, however, Jandun expresses all his dissatisfaction for the way in which such a position resolves the issue (namely, by denying the possibility of the existence on their own of sensible qualities that are not perceptible in act):

> So this responds to the issue, and to the arguments [opposing such a position]. But in truth, even though that is well and truly enquired, still I can neither believe nor conceive that that was Alexander's intention, and not even the intention of any

[831] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 20ra: "Tertio dicunt quod non est aliquod sensibilie in potentia quin possit sentiri vel secundum se vel in alio, quia si ita esset quod esset aliquod sensibile in potentia, nunquam actu potens snetiri, tunc potentia esset ociosa, quia potentia ordinatur ad actum sicut ad finem, ut patet quinto *Metaphysicae*. Ociosum autem est, quod est natum attingere aliquem finem, et non attingit ipsum, ut patet secundo *Physicorum*. Ergo si potentia sentiendi inest alicui sensui, si tamen nunquam potest actu sentire, erit illa potentia ociosa; sed hoc est incoveniens; quare etc. Item, cuius est potentia, eius est actus, ex *De sensu et sensato*; sed tali sensibili inest potentia sentiendi, ergo et [t]actus sentiendi sibi competit quoquo modo."

> expounder [of the *De sensu*], [namely] that there is something sensible that is not perceptible in act, understanding 'sensible' in this way, such as these [the *aliqui*] understand [it], i.e., insofar as 'sensible' is said from the potency to move the sense, i.e., that [the sensible] has in itself the potency to move the sense, and that it is perceived. Indeed, these understand the sensible so, as it appears in their arguments and in the solutions to the [contrary] arguments. That indeed [on such an understanding of 'sensible'] something is sensible, i.e., having the potency to move the sense, which can never be perceived, that is diabolic (*illud est diabolicum dicere*), because it immediately entails a contradiction. Indeed, such as it is impossible that something has the [property of] whiteness, and still it is not white, so it is impossible that something has the potency to be perceived, and still it cannot be perceived, for what concerns it (*quantum ex parte sua*), because such as whiteness gives the [fact of] being white, so the potency to move the sense gives the [fact of] being something that can be perceived, and it can be perceived that which has such a potency. And therefore understanding the sensible in this way, such as it is [said to be sensible] from the potency to be perceived and to move the sense, I do not believe that it was the intention of Alexander or of the other [commentators] that there is something sensible that cannot be perceived, because it is very clearly impossible. But maybe it was Alexander's intention in his words quoted above and in other similar ones, and similarly of the others discussing this issue, that there is a body so small that, even though it has in its being some primary or secondary quality, such as whiteness and blackness and heat or coldness, still it can never be perceived by itself and on its own due to its smallness, and that body so small, if there is in nature something of this kind, will not be called 'sensible' from the potency to be perceived, i.e., because it has in itself the power of acting on the sense[832].

The passage contains the key to Jandun's solution to the dilemma presented above, and, more generally, to his characterisation of "imperceptible" sensible qualities. Indeed, it is clear for him that Alexander believed in the possibility of the existence on their own of sensible qualities that are not perceptible in act, such as the almost totality of the Latin commentators of the *De sensu* Jandun was acquainted with. This belief is, however, what

[832] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 20rb: "Sic dicunt isti ad quaestionem et ad rationes. Sed in veritate, quamvis illud sit bene et realiter inquisitum, tamen non possum credere nec videre quod illa fuerit intentio Alexandri, immo non alicuis expositoris, quod sit aliquod sensibilie quod non possit actu sentiri, sic accipiendo sensibile, sicut isti capiunt, scilicet prout sensibile dicitur a potentia movendi sensum, scilicet quod habet in se potentiamo movendi sensum et quod sentiatur. Sic enim accipiunt isti sensibile, ut patet in suis rationibus et in solutionibus argumentorum. Quod enim aliquid sit sensibile, i.e. habens potentiam movendi sensum, quod nunquam potest sentiri, illud est diabolicum dicere, quod statim includit contradictionem. Sicut enim impossibile est quod aliquid habeat albedinem et tamen non sit album, sic impossibile est quod aliquid habeat potentiam ut sentiatur et tamen non possit sentiri, quantum ex parte sua, quia sicut albedo dat esse album, sic potentia ad movendum sensum dat esse potens sentiri, et posse sentiri ei quod habet talem potentia. Et ideo sic accipiendo sensibile, prout est a potentia sentiendi et movendi sensum, non credo fuisse intentionem Alexandri nec aliorum quod sit aliquid sensibile quod non possit sentiri, quia valde manifestum impossibile est. Sed forte fuit intentio Alexandri in suis verbis praeadductis et aliis similibus, et similiter ailorum loquentium de hac materia, quod est aliquod corpus ita parvum quod licet habeat in esse suo aliquam quailtatem primam aut secundam, ut albedinem et nigredinem et caliditatem aut frigiditatem, tamen ipsum secundum se nunquam potest sentiri et seorsum, propter parvitatem suam. Et illud corpus sic parvum, si sit in rerum natura aliquod tale, non diceretur tale sensibile a potentia sentiendi, scilicet quia habeat in se virtutem agendi in sensum."

Jandun now refers to as a *diabolicum dicere*, using an expression which underlines the subtletly, but also, ultimately, the falsity of it. And why is such a belief so unacceptable? Jandun, again, resorts here to Averroes' argument (this is, in any case, the implicit premiss of his reasoning), to claim that, if the sensible is defined by its power to act on the sense (therefore if the proper operation of a sensible quality is that of acting on the sense), and if an essence cannot exist without the power to perform its proper operation, then the existence on its own of a sensible quality that is not perceptible in act (something, thus, which has the essence of a sensible quality but not the power to perform its proper operation) immediately entails a contradiction. Here Jandun reasserts with unprecedented vehemence his opposition to the possibility of the existence on their own of sensible qualities that are not perceptible in act, if such qualities are defined by the power to act on the sense and if an essence cannot exist without the power to perform its proper operation. Moreover, he now states in extremely clear terms, on the basis of Averroes' argument (as applying not only to the actual world, but also to a possible one without the corrupting action of the containing medium) that the very possibility of *conceiving* a sensible quality that exists in act without the power to perform its proper operation must be denied, insofar as it is contradictory.

Does this mean that Jandun denies the possibility of the existence on their own of sensible qualities that are not perceptible in act (according to the reasoning of the *aliqui*)? Not at all. Quite to the contrary, Jandun finds a solution that allows him to escape the dilemma presented above, and to make the possibility of the existence on their own of sensible qualities that are not perceptible in act compatible with Averroes' argument. The solution lies in denying that the existence of an essence within a given material substance depends on the existence of the power to perform its proper operation. Rather, the existence of an essence within a given material substance, according to Jandun, depends on the existence of a *disposition* to acquire the power to perform its proper operation, once certain external conditions are satisfied. Only in this limited sense is Averroes' argument to be considered valid and, indeed, true, according to Jandun. How does Jandun describe this disposition, and what are the external conditions that, in the case of sensible qualities, would make them acquire the power to perform their proper operation? The answer lies in the following passage:

> But it [i.e., a sensible quality existing in act without being perceptible in act] will be called 'sensible' insofar as the sensible is distinguished from the mathematical, because the mathematical, insofar as it is mathematical, does not include in its being any quality, neither primary nor secondary. However, that body [i.e., a sensible one which is too small to be perceived in act] is informed in act by some quality, primary or secondary, under this small quantity that is not sufficient to move the sense. Or it will be called 'sensible' not from the potentiality to be perceived exising in it there by itself, but because of its genus, i.e., because it is not incompatible to be perceived for the reason that it is a body informed by a primary or a secondary quality. Or maybe it could be called 'sensible' not from the potency to move the sense on its own and by itself, but because united with other [parts too small to be perceptible in act] it contributes to the perceptibility [in act] of the whole composed by it and by the other [parts too small to be perceptible in act], [something] that a purely mathematical body[833] would not do[834].

According to Jandun, a sensible quality (and, as a consequence, a sensible body insofar as it is informed by one or more sensible qualities) can be called such if it possesses a disposition to acquire the power to act on the senses, and such disposition is identified by three elements (that I believe are to be read in a unitary way, not as independent one from the other). First of all, and preliminarily, such a disposition is identified by the fact that it distinguishes the material substance in which the sensible quality inheres from every mathematical entity. Secondly, it is identified by the fact that it makes the accidental form of the sensible quality considered logically compatible with the power to act on the senses. Thirdly, it is identified by the fact that it allows the form of the sensible quality considered to acquire the power to act on the senses (and therefore to be perceptible in act) once an external condition is satisfied, namely, once the material substance in which such a sensible quality inheres has become part of a whole formed by a sufficient number

[833] On the use of this expression by Jandun here, see the considerations already put forth in Chapter 2. In agreement with what I said there, I think that even in this case the expression is used without any strong metaphysical implications. The expression, in other words, is not used to refer to a positively characterised category of entities (such entities would, indeed, be entirely contradictory in the Aristotelain worldview, since what is mathematical is, by definition, abstracted from matter and change, and therefore certainly it cannot be defined a 'body'). More simply, I suspect that the expression is merely used in a negative sense, that is, to find a useful lable to refer to a hylomorphic compound existing on its own deprived of sensible qualities (according to the use of 'mathematical' mentioned by Jandun at the beginning of the passage quoted). This is why the expression is not taken to be in need of any justification by Jandun.

[834] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 20rb: "Sed diceretur sensibile prout sensibile distinguitur a mathematico, quia mathematicum, unde mathematicum est, non includit in esse suo aliquam qualitatem nec primam nec secundam. Illud autem corpus est informatum actu aliqua qualitate prima aut secunda sub ista parva quantitate quod non sufficit ad movendum sensum. Vel diceretur sensibile non a potentia sentiendi secundum se ibi inexistente, sed ratione sui generis, scilicet quia non repugnat sentiri ratione qua est corpus informatum qualitate prima aut secunda. Vel forte posset dici sensibile non a potentia movendi sensum seorsum et secundum se, sed quia coniunctum aliis auxilium conferret ad sensibilitatem totius aggregati ex ipso et aliis, quod non faceret corpus mathematicum pure."

of portions of matter that, by themselves, are too small to be perceptible in act (here Jandun is clearly evoking the third meaning of potentially perceptible).

The same position (although presented more quickly and with less detail) is restated by Jandun in the *responsio ad rationes* of q. 30, where he also explicitly says that what is true of the accidental forms of sensible qualities is also true of substantial forms[835] (namely, that they can exist in a material substance without the power to perform their proper operation, but merely with the disposition to acquire it, under suitable external conditions):

> To the other [argument, namely, that nothing can exist without its proper operation, and, since the proper operation of sensible qualities is that of acting on the senses, they cannot exist on their own without being perceptible in act[836]] it can be replied that nothing can be without its proper operation, i.e., [without the fact] that, for what concerns its form, it is not incompatible with it to have the operation of that nature, however it is not necessary that everything that has a certain nature in act has the immediate power to [perform] the proper operation of that [nature], but it is enough that that is not incompatible with it for what concerns its form. If it is given that, e.g., a man who has [his] proper operation, it is not necessary that everything having the human nature has the proximate and immediate power to perform the proper operation of man (*potentiam proprinquam et immediatam ut operetur operationem hominis propriam*), but it is enough that it has the substantial form on whose part it has the aptitude (*aptitudo*) to the operation of man, and that it is not incompatible with it. If, indeed, it did not have [it], then it would not be a man if not equivocally. So is the case in the issue at hand: indeed that body has a form by which being perceived is not incompatible with it, if it has a sufficient dimension, and this is enough [to reply to the argument]. Or it could be replied to the minor [premiss] that it is not the proper operation of a primary or secondary quality to move the sense by itself, but it is enough that it moves [it] with another [body][837].

[835] This is a remarkable aspect, that is also, at first glance, difficult to be made compatible with Jandun's doctrine of *minima naturalia* in his commentary on *Physics* I.4. I will discuss it below while analysing q. 30 of Jandun's commentary.

[836] Cf. Jandun's presentation of the argument earlier in the *quod non* section of q. 30, where, interestingly, Averroes' authority (the same as in q. 29) is supplemented by Aristotle's one: "Item, nihil potest esse sine operatione propria, ut vult Aristoteles in quarto *Meteorum* et Commentator nono *Metaphyisicae*. Sed operatio propria qualitatis primae vel secundae est movere sensum, ergo potest nihil esse informatum aliqua qualitate prima aut secunda quin possit movere sensum" (IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 30, Venetiis 1557, f. 20va).

[837] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 30, Venetiis 1557, f. 21rb: "Ad aliud potest dici quod nihil potest esse sine operatione propria, scilicet quod, quantum est ex parte suae formae, non repugnat sibi habere operationem illius naturae, tamen non oportet quod omne actu habens aliquam naturam possit immediate in operationem propriam illius, sed sufficit quod ex parte suae formae non repugnet sibi. Si detur illud, verbi gratia homo qui habet operationem propriam, non oportet quod omne habens naturam humanam habeat potentiam propinquam et immediatam ut operetur operationem hominis propriam, sed sufficit quod habeat formam substantialem, ex parte cuius habeat aptitudinem ad operationem hominis, et ei non repugnet. Si enim non haberet, tunc non esset homo nisi aequivoce. Sic est in proposito: nam illud corpus habet formam qua sibi non repugnat sentiri, si haberet sufficientem magnitudinem, et hoc sufficit. Vel dicatur ad minorem quod non est operatio propria qualitatis primae aut secundae movere sensum seorsum, sed sufficit quod moveat cum alio."

On Jandun's model, therefore, it becomes conceivable that sensible qualities can exist on their own without being perceptible in act, provided that they possess the disposition to acquire the power to act on the senses described according to the three elements just mentioned. The most important consequence of Jandun's conceptual model is, evidently, that it gives sensible qualities a much higher degree of autonomy from the external senses and from perception as a whole than they would otherwise enjoy. Far from being essentially tied to their ability to act on the senses, sensible qualities can, on this model, exist on their own without ever becoming perceptible in act. What ultimately characterises them, therefore, is not anymore the fact that they are the object of sense perception, rather, the fact that they provide a "demarcation criterion" of the natural world[838] from everything that does not belong to it (and that, of course, as such could never be directly cognised by the senses).

This proposal is not completely without antecedents in the Medieval Latin world. Indeed, as I have shown in the previous chapter, at least Bacon had come close to suggesting that, if a sensible quality can exist on its own without being perceptible in act (as a mere conceptual possibility, supposedly), then, in order for it not too exist without a purpose, it had to have "other relations" to the sense than the mere ability to act on it, and Bacon understood these relations to refer to the fact that sensible bodies too small to be perceptible in act are the "building blocks" of the natural world. Jandun's proposal is, of course, to be considered fully independent from Bacon's one, lacking any textual element providing evidence to the contrary[839]. What is more, it is also a bolder one. Indeed, in Jandun's view sensible qualities acquire a much higher degree of autonomy from the senses than they did in Bacon. If, evidently, also for Jandun sensible qualities united to portions of matter too small to be perceptible in act are the "building blocks" of bodies that are perceptible in act, as the presentation of the third element mentioned above explicitly claims, still, the first two elements point to characteristics of sensible qualities that are defined fully independently of the senses. Thus, with Jandun sensible qualities mostly lose the traditional relational character that they have in the Aristotelian

[838] Note that here (as in the thesis in general) I use this expression as a mere label to refer to the "outside (sublunary) world" of material substances that surrounds us in the Aristotelian worldview.
[839] Although, interestingly, in the last passage quoted Jandun has recourse to the notion of *aptitudo*, which had entered the debate on *minima sensibilia* with Bacon.

worldview, to become (partially) autonomous entities that "mark the boundaries" of the natural world. It goes without saying that such a characterisation, at the same time, also has important consequences for the understanding of the process of perception itself that, in such a view, seems at least open to be understood as involving a more active role of the senses themselves than the one traditionally admissible in the Aristotelian worldview.

Although Jandun never goes so far as to suggest that the senses might possess such a more active role (to the point of being able to causally initiate the process of perception), he does, nevertheless, at least recognise that the senses are not mere passive powers, thanks to his famous notion of the *sensus agens*, to be understood in analogy with the *intellectus agens*. Unfortunately, there is no space to discuss this notion here in its own right[840]. Nevertheless, the fundamental point to remark here is that such a notion, according to Jandun's understanding, presupposes that the senses take an active role with respect to a sensation that has been *already* impressed upon them by sensible qualities[841] (in analogy with what the agent intellect does with the species received from the sensitive

[840] The origin of the doctrine of the *sensus agens*, absent from Aristotle, is usually linked with Averroes' *Long Commentary* on *De anima* II.5, 417b22-29. For an interpretation of Averroes' remarks in this respect, see. J.-B. BRENET, *Agent Sense in Averroes and Latin Averroism*, in J.F. SILVA, M. YRJÖNSUURI (eds.), *Active Perception in the History of Philosophy. From Plato to Modern Philosophy (Studies in the History of Philosophy of Mind 14)*, Dordrecht, Springer, 2014, pp. 147-166, which also provides some useful remarks on Jandun's interpretation of the *sensus agens*. On the origins of the notion of the *sensus agens* in the Medieval Latin commentary tradition of the 13th century, see P. BERNARDINI, "La passività del senso nei commenti alla *Vetus* del *De anima*. Le origini della dottrina del *sensus agens*", *Documenti e studi sulla Tradizione filosofica medievale* XXV, 2014, pp. 243-288. For a global reconstruction of the debate on the *sensus agens* (albeit only a very general one), from its beginnings in the Latin Middle Ages up until the end of the 16th century and beyond, see especially A. PATTIN, "Pour l'histoire du sens agent au Moyen Âge", *Bulletin de philosophie médiévale* 16/17, 1974, pp. 100-113. Jandun devoted to the issue of the *sensus agens* not only q. II.16 of his *Quaestiones in De anima*, edited independently as *Quaestio de sensu agente*, but also at least two independent treatises, the *Sophisma de sensu agente* and the *Tractatus de sensu agente*, which must be read in connection with a polemics against Bartholomew of Bruges on the issue. All these texts have been edited in A. PATTIN, *Pour l'histoire du sens agent. La controverse entre Barthélemy de Bruges et Jean de Jandun, ses antécédents et son évolution. Études de textes inédits*, Leuven, Leuven University Press, 1988, respectively on pp. 223-234, 118-165 and 166-222 (in the same volume one can also find, on pp. 46-94, an edition of Bartholomew of Bruges' *De sensu agente*, where the existence of a *sensus agens* is denied). For the interpretation of Jandun's doctrine of the *sensus agens*, also in relation to his polemics with Bartholomew of Bruges, see especially A. PACCHI, "Note sul commento al *De anima* di Giovanni di Jandun. I. La teoria del senso agente", *Rivista Critica di Storia della Filosofia* 13 (4), 1958, pp. 372-383, S. MACCLINTOCK, *Perversity and Error. Studies on the "Averroist" John of Jandun*, Bloomington, IN, Indiana University Press, 1956, and PATTIN, *Pour l'histoire du sens agent*, *op. cit*. For the wider context of Jandun's noetics, within which the issue of the sensus agens must be situated, see especially J.-B. BRENET, *Transferts du sujet. La noétique d'Averroès selon Jean de Jandun*, Paris, Vrin, 2003.

[841] Cf. IOANNES DE JANDUNO, *Sophisma de sensu agente*, in PATTIN, *Pour l'histoire du sens agent. La controverse entre Barthélemy de Bruges et Jean de Jandun, ses antécedents et son évolution. Études de textes inédits*, *op. cit.*, p. 152, ll. 43 sqq.: "[...] per sensum enim agentem intelligimus virtutem animae, quae immediate efficit sensationem in sensu passivo disposito per speciem a sensibili sibi impressam."

soul), therefore the very possibility of the existence of a *sensus agens* presupposes that sensations are causally produced in the senses by the action of the sensible qualities, and no active role is recognised by Jandun to the senses in the *production* of such sensations. This said, it is in any case noteworthy, and it must be stressed here, that Jandun's "re-definition" of sensible qualities in q. 29 of his *De sensu* commentary, which provides a more "passive" characterisation of sensible qualities than they have in the traditional Aristotelian worldview, represents a nice counterpoint to his attempt, elsewhere in his writings, to provide a more "active" characterisation of the senses than they have in the traditional Aristotelian worldview. It is therefore to be particularly regretted that he never tried to weave the two attempts together in a single theoretical framework.

Note, instead, that with the third element in his "re-definition" of sensible qualities Jandun also opens the way to the “corpuscularian” implications of the third meaning of potentially perceptible. These implications, however, will be more fully developed in q. 30 of the commentary, where Jandun discusses the issue of the existence on their own of sensible qualities that are not perceptible in act in the actual world, and not merely as a conceptual possibility, as I will now show.

Indeed, the whole reasoning of q. 29 seems to have been oriented to find a way to make the existence on their own of sensible qualities that are not perceptible in act acceptable as a conceptual possibility (one, moreover, compatible with Averroes’ argument, or, to be precise, with a limited version of it). It is only, however, in q. 30 that Jandun goes on to provide the arguments in favour of the idea that such a position is not only a conceptual possibility, but also a correct description of the actual world.

Before, however, introducing his arguments in favour of this position, Jandun inserts an *excusatio*:

> It must be understood that the question is immensely difficult both because of the fact that it is unusual, because it is not customary to dispute it, and due to the conflict of the arguments on each side. However, for now it suffices to me to say some probable things, that maybe would provide others an occasion to think, so that [they] find a more perfect truth[842].

[842] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 30, Venetiis 1557, f. 20vb: “Est intelligendum quod quaestio est valde difficilis, tum propter inusitationem, quia non est consuetum eam disputare, tum propter conflictum rationum ad utranque partem. tamen ad praesens sufficit mihi dicere aliqua probabilia, quae forte sint aliis occasio cogitandi, ut inveniant perfectius veritatem.”

Jandun's claim is not entirely correct. Indeed, as I have shown in the previous section, almost all the elements of this discussion were already present in the positions on *minima sensibilia* adopted by commentators active at the Parisian Faculty of Arts at the turn of the century. Still, although exaggerated for rhetorical purposes, Jandun's statement is certainly true if it is interpreted as claiming that no previous Medieval Latin commentator (with the possible exception of Albert) had ever tried to argue in favour of the *permanent* existence on their own, in the actual world, of sensible qualities that are not perceptible in act. Indeed, all the commentators analysed in the previous section only admitted their existence for a short span of time during the process of corruption of extremely small portions of material substances by the containing medium (a conception that, as said, Jandun does not share). According to Jandun's model, instead, as I have already suggested, and as I will now show more in full, such "imperceptible" sensible qualities become a constant feature of the natural world.

Jandun divides the presentation of his position in this respect, and therefore also the arguments in support of it, in two parts. The first part is devoted to show that it is possible that there is in the actual world a material substance possessing sensible qualities which are not perceptible in act once it is considered on its own. The second part is devoted to showing that it is not possible that such a substance cannot contribute to the perception of a sufficiently great sensible whole formed by parts that are not perceptible in act on their own.

Let us start from the first part. Here, as said, Jandun wants to show that it can well be (or it is at least more probable, to respect his initial *excusatio*) that (in the actual world, evidently) some portions of a sensible whole (together with their sensible qualities) can exist on their own without being perceptible in act[843]. The conceptual premiss from which Jandun derives his view, as seen at the end of q. 28, is likely the idea that the threshold of corruptibility of sensible qualities is inferior to that of their perceptibility, so that, within a certain "size-range" of the portion of matter to which they are united, sensible qualities can exist on their own without being perceptible in act. Nevertheless, Jandun (among other arguments) provides now an original argument in favour of this position, one that I have not been able to find in any previous *De sensu* commentary.

[843] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 30, Venetiis 1557, f. 20rb: "Et dico duo. Primo quod possibile est in rerum natura aliquod corpus esse informatum aliqua qualitate prima vel secunda, quod nunquam potest seorsum et secundum se sentiri."

The argument is based on an analogy between the ability of a sensible whole to move the sense (in terms of alteration) and the corresponding ability of a mover to move a moving body (in terms of local motion). Jandun, in this way, wants to bring into the debate on *minima sensibilia* an argument taken from *Physics* VII (249b27-250b5), where Aristotle claims that, if a given mover has the power to move a certain other body, it is not true that any of its parts has the power to move it (or, at the very least, it is not true that any part of the mover can move the moved body over the same distance in the same time or in a shorter one). Analogously, Jandun claims, if a sensible whole has the power to move the sense, it is not true that any of its parts has the power to move that same sense (since, as Jandun states here, the action of the sensible on the sense is *always* an "instantaneuous" one, it is not possible to claim, as in the case of the mover, that a part of the sensible moves the sense in a longer time than the one required to the whole to do so)[844]. The reason to have recourse to this analogy seems to be the fact that the case of local motion shows in a more plastic and effective way this principle than the case of perception. Still, the two cases are clearly heterogeneous, since they concern two different kinds of motion, and Jandun also appears to admit it (*Et videtur mihi quod multo magis hoc videretur in aliis virtutibus motivis*). It must be remarked, however, that with this argument Jandun does not want to claim that there are indeed in the actual world parts of

[844] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 30, Venetiis 1557, ff. 20vb-21ra: "Probatio huius [i.e., that if a sensible whole is perceptible in act it does not follow that any of its parts taken on its own is perceptible in act], quia si esset necessarium quod cum aliquod totum est sensibile quaelibet pars ipsius per se subsistere potens posset actu secundum se sentiri, tunc similiter esset de qualibet alia virtute movente quod tamen aliqua virtus movet aliquod mobile quaelibet pars ipsius posset aliqualiter movere illud mobile secundum se existens. Non enim video ad praesens rationem diversitatis, quare oporteat quod quaelibet pars totius sensati seorsum existens possit movere sensum, et non opoertat hoc in aliis moventibus, quod si partes seorsum subsistere potentes possint movere illud, quod a toto movetur, et ideo illud sequitur in omni virtute movente. Si esset necessarium in virtute movente sensum, modo illud consequens est falsum, et contra Aristotelem in septimo *Physicorum*, ubi probat quod non oportet si aliqua virtus movet aliquod mobile in aliquo tempore, quod pars virtutis moveat in maiori tempore vel in aequali tempore per partem spatii. Et videtur mihi quod multo magis hoc videretur in aliis virtutibus motivis, quod cum possit aliquid movere, quaelibet pars debeat habere potentiam movendi illud mobile, quia non oportebit ibi dicere quod aeque velociter moveat pars et totum, immo diceretur quod totum movet velocius, et in minori parte temporis, pars autem in maiori tempore vel in aequali tempore per minus spatium. Sed si in sensibili illud diceretur, quod cum aliquod sensibile totum habet virtutem movendi sensum, et quamlibet partem eius seorsum existentem habere virtutem movendi ipsum sensum, tunc aeque velociter vel saltem non minus velociter pars moveret et totum, quia utrumque moveret in instanti, nam immutatio sensus a sensibili sit in <in>stanti. Et sic si illud poneretur in sensibili, tunc deberet sequi in aliis motivis, quod tamen est falsum. Non igitur oportet quod si aliquod sensibile movet ipsum sensum, tunc quaelibet pars possit secundum se movere. Immo est possibile aliquas partes eius secundum se existentes non posse movere, ergo sequitur conclusio principalis, scilicet quod possibile est esse aliquod corpus habens qualitatem sensibilem quod tamen secundum se nunquam potest sentiri."

a sensible whole existing on their own endowed with their own sensible qualities without being perceptible in act. Rather, by this argument he simply wants to claim, following Aurélien Robert's very effective synthesis, that "*it is not necessary* that any separate part of the sensible whatsoever move the senses; then *it is possible* that some parts existing on their own do not move the senses[845]". To put it more bluntly, the argument, although it cannot prove the existence on their own of portions of matter separate from the whole to which they belong that are not perceptible in act in the actual world, still makes *possible* to claim it. This less ambitious aim would, then, be compatible with the use by Jandun of an argument that has more rhetorical than logical value, and its purpose would be that of preparing the reader to the introduction of a true argument in favour of this view.

Before getting to such an argument, however, Jandun inserts a second argument merely meant to make the view that sensible qualities can exist on their own, in the actual world, without being perceptible in act more probable than the opposite one. The passage where the argument is introduced is the following one:

> Moreover, someone (*aliquis*) could argue to the same conclusion probably, because if what is less apparent to be is [the case], then that which is more [apparent] will also be the case. But it is more apparent that the substantial forms can be in their matters under such a small quantity that they cannot perform their proper operation (*opus proprium*) remaining under such quantity. [...] And so let us see [the argument] in the same substantial forms. Indeed, the human form (*forma humana*) can be in matter under so small a quantity that that compound, for the time in which it remains under that quantity, does not have the proximate potentiality (*potentiam propinquam*) of performing the proper operation of man, and not even the many other operations of inferior order to the human operation. Because [of this] it appears much more possible that there is some primary or secondary quality in a subject under such a small quantity that that subject cannot, while it remains in such quantity, move the whole sense. Still that argument is opposed, because perfect substantial forms require an organisation in their body [in order to perform their proper operation], not, however, those sensible qualities. [Thus, this argument] has limited probability[846].

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[845] ROBERT, "John of Jandun on *Minima Sensibilia*", *op. cit*., p. 398. Emphasis in the original.

[846] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 30, Venetiis 1557, f. 21ra: "Adhuc posset aliquis arguere ad idem probabiliter, quia si quod minus videtur esse, est et illud quod magis. Sed magis videretur quod formae substantiales possent esse in suis materiis sub ita parva quantitate quod non possent manentes sub tali quantitate in opus proprium [...]. Et ita videmus in ipsis formis substantialibus. Potest enim forma humana in materia sub ita parva quantitate esse quod illud compositum quandiu stat sub illa quantitate, non habet potentiam propinquam operandi operationem propriam hominis, immo nec alias multas operationes inferioris ordinis ad operationem humanam, quare multo videtur fortius possibile quod sit aliqua qualitas prima aut secunda in subiecto sub ita parva quantitate quod non possit illud subiectum secundum se dum stat in tali quantitate movere omnem sensum, tamen illud argumentum calumniatur, quia formae substantiales perfectae requirunt organizationem in suo corpore. Non autem istae sensibiles qualitates. Saltem habet probabilitatem."

The passage interestingly connects, once again, the debate on *minima sensibilia* with that on *minima naturalia*. Nevertheless, it also appears, at first glance, to be in tension with the doctrine of *minima naturalia* Jandun presented in his commentary on *Physics* I.4. There, as I have shown in Chapter 2, he clearly stated that substantial forms are not capable of subsisting on their own when they are not capable of performing their proper operation. Still, his discussion in the commentary on *Physics* I.4 was, as it was usual for Medieval Latin commentators, focused on the case of inanimate homogeneous substances, and therefore the reference to the soul as the substantial form of man as an example here (as in the passage from the *responsio ad rationes* of q. 30 quoted above) appears to be an attempt by Jandun to overcome the difficulty by picking out a paradigmatic case where it is possible to conceive a substantial form that, while being present in a given body, does not have the power to perform its proper operation due to the smallness of the body itself, without the risk that the material substance concerned is corrupted by the action of the containing medium[847]. The case Jandun has in mind, therefore, seems to be clearly that of the late stages of development of the embryo (once it has been infused with the rational soul by God) and of the first years of the infant, before it starts to develop his power of understanding. Nevertheless, the example is problematic, given that, even though Jandun believes that the same relation between an essence and the power to perform its proper operation holds both for substantial and for accidental forms, still the substantial form of man seems too heterogeneous a case to be compared with the accidental forms of sensible qualities. Jandun himself raises an objection noting the difformity between the two cases (and, more in general, between what is true of substantial forms and what is true of accidental ones) and therefore, such as in the case of the previous argument, severely limits the demonstrative power of this argument.

Thus, none of the two arguments presented by Jandun can do more than trying to make room for, or even persuade in favour of, the existence on their own of sensible qualities that are not perceptible in act in the actual world. It is only at this point that

[847] In this case, one might try to claim that the doctrine of *minima naturalia* presented by Jandun in this passage only concerns heterogeneous material substances, whereas the one discussed in his commentary on *Physics* I.4 only focuses on homogeneous material substances. Still, even if it were so, it would be hard to deny that a certain degree of tension between the two views remains.

Jandun introduces what he evidently takes to be the decisive argument in favour of this position:

> And I argue taking the argument from the words of Alexander, who appears to hold this position: any time that something was born to act on something else under a determined quantity, it is possible that it is so small that it cannot perform this action, and that appears by referring to all [the entities] that require a determined quantity to their action. But the sensible itself was born to act on the sense under a determined quantity. Not, indeed, in mere quantity, but in the quantity of power that <comes> from the sensible the movement [produced by it] is sensible in act, such as Alexander writes[848].

The decisive argument is, as it appears clearly from the passage, an appeal to Alexander's authority. This is in itself remarkable, since, as I have shown in the previous chapter, Alexander never affirmed the existence on their own of sensible qualities that are not perceptible in act in the actual world, but only in a possible one. Here, however, it seems that Jandun's interpretation of Alexander is largely influenced by the interpretations of commentators such as those analysed in the previous section, as it appears by Jandun's use of expressions such as *natum agere in aliud sub determinata quantitate*. Indeed, these expressions are way more generic and incomplete than the refined position adopted by Jandun in q. 29 concerning the disposition related to the essence of sensible qualities, but, at the same time, they are perfectly in line with, and sometimes almost *verbatim* quotations of, the discussion of *minima sensibilia* developed by the commentators analysed in the previous section. Thus, even if Jandun did not share with these commentators the reason that moved them to revise the interpretation of Alexander's position (namely, a new conception of the unfolding of the process of substantial change), still one has to admit that Jandun took from these commentators the new interpretation of Alexander's position that they had developed. What, however, in such commentators was merely an interpretation, in Jandun becomes the correct way of reading Alexander's own position. This passage therefore presents the culmination of an exegetical change that

[848] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 30, Venetiis 1557, f. 21ra: "Et arguo ratione sumpta ex verbis Alexandri, qui istam positionem videtur intendere: quandocunque aliquid est natum agere in aliud sub determinata quantitate, possibile est ipsum esse ita parvum quod non potest agere istam actionem, et illud videtur inducendo in omnibus quae ad sui actionem requirunt quantitatem determinatam. Sed ipsum sensibile natum est agere in sensum sub quantitate determinata. Non enim in quantitate sola, sed in quantitate virtutis quae a sensibili <est>, motus sit actu sensibilis, ut Alexander scribit."

brought the existence on their own of sensible qualities that are not perceptible in act into the actual world and, as such, that brought to the denial of the validity in the actual world of the Aristotelian principle of the coextension of the sensible world and of the perceptible one.

Jandun, moreover, is not content with this result. Indeed, as I have mentioned, the second part of his solution is devoted to the idea that it is not possible that any sensible quality existing on its own without being perceptible in act in the actual world cannot become perceptible in act by becoming part of a sufficiently great sensible whole. Indeed, insofar as Jandun's position is not based on a temporally extended conception of substantial change, rather on the idea that the threshold of the corruptibility of sensible qualities is inferior to the threshold of their perceptibility, Jandun has to face an issue that the commentators analysed in the previous section could avoid, insofar as they believed in the existence on their own, in the actual world, of sensible qualities that are not perceptible in act *only* during the process of corruption. This is the issue of whether such sensible qualities can become perceptible in act by uniting to each other. Jandun is firmly committed to the idea that such sensible qualities can become perceptible in act by uniting to each other, and, in order to articulate this view and to argue for it, he applies the "corpuscularian" implications of the third meaning of potentially perceptible to the actual world, and he does so by developing a full "corpuscularian" conceptual model in this respect. Indeed, while arguing that there cannot be any portion of matter possessing a sensible quality so small that it cannot become perceptible if it becomes part of a sufficiently great sensible whole (that is also the third element of the disposition related to the essence of sensible qualities defined at the end of q. 29), Jandun presents an argument that appears to be original with respect to known previous *De sensu* commentaries. In it, he reasons in clearly "corpuscularian" terms to show that, if the "smallest" components of a sensible whole (which are not perceptible in act when existing on their own) were not perceptible once they came together to form it, then even the whole would not be perceptible, since a whole is only perceptible insofar as its parts are perceptible (and since this is impossible, so is the premiss from which this conclusion stems):

> The consequence [i.e., that if the "smallest" components of a sensible whole (which are not perceptible in act when existing on their own) were not perceptible once they

> come together to form it, then even the whole would not be perceptible] is proved, because if it is posited some such body that can never be perceived, neither by itself nor united with another [body], then for a comparable reason (*pari ratione*) that which is equal to it will not be perceived by itself in any way. However, in any sensible whole there would be included many parts equal to that small body that you claim can never be perceived, e.g., if you claim that some white [body] so very small, so [small] that neither can it be perceived by itself, nor united with another [body] makes so that the whole composed by it and something else is sensible. Then let us take some white [body] of a greatness sufficient to move sight. It is certain that in that white [body] that can move sight is included something equal to that smaller [body]. Indeed, [what is] greater [than it] is of such dimensions and something more. For this reason it follows that in that greater white [body] there will be some parts that are not perceived in any way, and those which are equal to that extremely small white [body] that you claim cannot be perceived in any way; and so that greater white [body] will not be sensible if not because of some of its parts, and so it will not be in the first place and by itself sensible, and the same judgment will be concerning the other sensibles, and so nothing will be sensible in the first place, which is impossible. Therefore no body is such that it cannot be perceived in any way, and this is Alexander's intention, such as it appears to [he] who considers his commentary in a diligent way (*inspicienti commentum suum diligenter*)[849].

The passage is probably the only one, at least among those analysed so far in this chapter and in the previous one (save for Albert's case), that proposes in such clear terms a "corpuscularian" understanding of *minima sensibilia* (by providing a "corpuscularian" understanding of the relation between the perceptibility of a whole and that of its parts). Such a characterisation will exert an important influence at least on Buridan's conception of *minima sensibilia*, as I will show below.

The journey to reach this destination has been long and complex, as I have shown, insofar as, by itself, the debate on *minima sensibilia* is theoretically independent from any "corpuscularian" implications. Still, the interpretation of Aristotle's "corpuscularian" remark at 446a10-15 and, especially, of Alexander's remarks upon it, as referring to the actual world, together with an understanding of the qualities of a sensible whole as

[849] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 30, Venetiis 1557, f. 21ra: "Consequentia probatur, quia si ponatur aliquod tale corpus quod nunquam possit sentiri, nec secundum se nec unitum alteri, tunc pari ratione illud quod ei est aequale nullo modo per se sentitur. Modo in quolibet toto sensato includerentur multae partes aequales illi parvo corpori quod tu ponis nunquam posse sentiri, verbi gratia, si ponas aliquod album ita multum parvum, ita quod nec secundum se possit sentiri, nec alteri unitum faciat adhuc quod totum aggregatum ex ipso et alio quodam sit sensibile. Tunc capiatur aliquod album sufficientis magnitudinis ad movendum visum. Certum est quod in illo albo quod potest movere visum includetur aliquid aequale illi minori. Nam maius est tantundem et aliquid plus. Quare sequitur quod in illo maiori albo erunt aliquae partes quod nullo modo sentiuntur, et illae quae sunt aequales illi parvissimo albo quod tu ponis nullo modo sentiri, et sic illud album maius non erit sensibile nisi ratione aliquarum suarum partium, et sic non erit primo et per se sensibile, et idem iudicium erit de aliis sensibilibus, et sic nihil erit sensibile primo, quod est impossibile. Ergo nullum corpus est quale quin aliquo modo possit sentiri, et ista est intentio Alexandri, sicut patet inspicienti commentum suum diligenter."

depending on the "union" of the sensible qualities of all of its parts (even those too small to be perceptible in act on their own), brought Jandun to the development of such a model.

Nevertheless, how did Jandun conceive of this model? And, especially, how did such model, according to Jandun, relate to Democritean atomism? The answer is provided in a final *dubitatio* that Jandun raises at the end of q. 30. There, he remarks that in chapter 3 of the *De sensu*, discussing various theories concerning the generation of middle colours from the extreme ones of black and white, Aristotle attacked the Democritean view according to which middle colours are formed by the juxtaposition of extremely small parts of black and white. These parts, according to Aristotle's reconstruction of Democritus' theory, are not perceptible by themselves due to their smallness, but they become perceptible as part of the new whole that has the middle colour formed by their conjunction. Aristotle's argument against such a view, however, was exactly that no magnitude is not perceptible (in act) due to its smallness. The argument, therefore, Jandun notes, seems to be inconsistent with Aristotle's remark at 446a10-15, interpreted, as Jandun now does, in the sense that there are indeed in the actual world sensible qualities that are not perceptible in act when existing on their own. An easy way out of the conundrum might have been to take Aristotle's argument in *De sensu* 3 to be that there are no magnitudes that are not perceptible in act in any condition whatsoever (i.e., neither on their own nor as part of a greater sensible whole). Yet, Jandun notes, the Democritean view, at first glanve, seems to be invulnerable to this argument, since it entails that, although the extremely small parts of black and white whose juxtaposition constitutes middle colours are not perceptible in act on their own, they are perceptible in act as part of the new middle colours formed by their juxtaposition, exactly as Aristotle's portions of matter that are potentially perceptible in the third meaning in 446a10-15. This, however, is not really the case, as Jandun goes on to remark. The passage, which is worth quoting in full, not only provides Jandun's considered interpretation of Aristotle' argument in *De sensu* 3, but it also at the same time clarifies in what way Jandun's "corpuscularian" model concerning the behaviour of sensible qualities that are not perceptible in act when existing on their own is fundamentally different from Democritean atomism:

> I say that, however, these [i.e., the atomists] posited some magnitude entirely imperceptible according to [their] proper quality (*secundum qualitatem propriam*),

> because, even though [they] claimed that those small bodies are perceived in the whole, [they are] not, however, [perceived] according to their proper qualities, but according to some middle colour constituted by the conjunction of those [parts]. Aristotle however intends that there is no magnitude that is not perceptible according to its proper quality (*secundum suam propriam qualitatem*) either by itself or in a certain whole. Then they [i.e., the atomists] said the opposite, because [they] claimed that those small bodies are never perceived according to their proper quality, neither by themselves and on their own (because [the atomists] claimed that [when these bodies are] in this way they are entirely imperceptible), nor in another [greater whole] (because [the atomists] claimed that when [these bodies] are conjuncted they are perceived according to the middle colour [that they constitute])[850].

What truly differentiates the "corpuscularian" interpretation Jandun provides of Aristotle's remark at 446a10-15, and, more generally, of the third meaning of potentially perceptible, from Democritean atomism is the fact that in the latter, but not in the former, according to Jandun, it is possible (and even necessary) that some magnitudes are never perceptible in act, neither on their own nor as part of a whole sufficiently great to become perceptible in act. This is the case, for instance, for the extremely small parts that constitute the components of middle colours (such as it happens for all the other sensible qualities). To put it in other words, in the Democritean wordlview, as understood by Jandun, the "micro-structure" of the natural world (ultimately, the level of atoms, and, more specifically, of the atoms of black and white that are the components of the middle colours), remains always beyond the reach of the senses, that are only capable to perceive its "macro-structure" (middle-size material substances and their parts sufficiently great to be perceptible in act separate from it). This explains why Democritus could say that the sensible qualities perceived by the senses are only a deceptive appearance: the ultimate ontological and explanatory level of reality lies, indeed, fully beyond them.

In Jandun's view, however, this is entirely unacceptable. Although, indeed, he is firmly committed to the existence on their own (in the actual world) of sensible qualities that, when existing on their own, are not perceptible in act, and therefore to the denial of the validity in the actual world of the Aristotelian principle of the coextension between

[850] IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 30, Venetiis 1557, f. 21va: "Dico quod immo [quod] ipsi ponebant aliquam magnitudinem omnino insensibilem secundum qualitatem propriam, quia, licet ponebant illa parva corpora sentiri in toto, non tamen secundum suas proprias qualitates, sed secundum aliquem medium colorem constitutum ex coniunctione illorum. Aristoteles autem intendit quod nulla est magnitudo quin sit sensibilis secundum suam propriam qualitatem aut secundum se aut in toto aliquo. Tunc oppositum ipsi dicebant, quia ponebant ista corpora parva nunquam sentiri secundum suam qualitatem, nec secundum se et seorsum (quia sic ponebant ea omnino insensibilia), nec in alio (quia cum coniungebantur dicebant ea sentiri secundum medium colorem)."

the sensible world and the perceptible one (so that, instead, the sensible world is certainly greater than the perceptible one), still whatever portion of matter is endowed with a sensible quality, according to Jandun, has *ipso facto* the disposition to acquire the power to become perceptible in act once it becomes part of a sufficiently great whole. What the senses perceive in act in this last case, then, is, far from being a deceptive appearance, the same sensible quality that existed before without being perceptible in act. In this way, Jandun firmly preserves, against all sorts of (Democritean) atomism, our epistemic access to all the ontological levels of reality composing the actual world. It is not difficult to see how this final discussion, and the criticism against Democritean atomism present in it, closely resembles Albert the Great's similar criticism and his own "corpuscularian" model of sensible qualities, although in his case what existed on its own in the actual world without being perceptible in act were not sensible qualities themselves, but rather merely portions of material substances endowed with the *inchoationes* of their forms. Whether or not Albert's discussion influenced Jandun's own one, however, remains impossible to determine, lacking positive textual evidence in this respect[851].

4.2.2. John of Jandun on *Minima sensibilia*: A Summary

It should have become clear from the discussion above that Jandun's original and fascinating position on *minima sensibilia* stems from a dramatic theoretical tension. On the one hand, Jandun, probably under the influence of what had presumably become the majority position at the Parisian Faculty of Arts around 1310, wants to accept the existence on their own (both as a conceptual possibility and in the actual world) of sensible qualities that are not perceptible in act. On the other hand, Jandun attributes a fundamental weight to the relation between the essence of sensible qualities and their proper operation of acting on the senses so as to engender a sensation, a relation which Jandun, resorting to an important argument from Averroes' *Long Commentary* on the *Metaphysics*, interprets in the sense that the power to perform its proper operation is a necessary condition for a given entity to have its essence (in this sense, ti should be noted, Jandun's reflection on the issue does not limit itself to the case of sensible qualities).

[851] Although, as mentioned above, Jandun does refer to Albert's *De sensu* commentary explicitly in one case in his discussion of *minima sensibilia*.

Jandun's strategy to escape from the dilemma (first of all at the level of conceptual possibility) consists in claiming that an entity (in this case, a sensible quality) can possess its essence even when it does not have the power to perform its proper operation (in this case, that of acting on the external senses so as to engender a sensation), but merely the disposition (which presupposes logical compatibility, but goes beyond it) to acquire it under suitable conditions (in this case, the condition of being united with a sufficient quantity of a material substance endowed with the same sensible quality). In this way, Jandun comes to characterise sensible qualities as dispositional entities that are not defined by their relational character, i.e., by their power to act on the senses, if not in a very indirect way (thus, remarkably, they also take on a more "passive" role than the one they traditionally have in the Aristotelian tradition). Rather, the sensible is defined by the fact that it provides a "demarcation criterion" of the natural world, i.e., the outside (sublunary) world of material substances, a criterion that should therefore be read alongisde the traditional one of *Physics* II, namely, the one according to which what belongs to nature is defined by the possession of an inner principle of change.

When it comes to the application of this conceptual model not only to the realm of conceptual possibility, but also to the actual world, therefore claiming that sensible qualities that are not perceptible in act exist on their own in the actual world (and so denying the validity of the Aristotelian principle of the coextension of the sensible world and of the perceptible one in the actual world), Jandun takes a different route than his known predecessors at the Parisian Faculty of Arts, such as Brito and the two anonymous commentators analysed above. While the latter had, indeed, based their claim in this respect on a temporally extended conception of substantial change, thus on the idea that the corruption by the containing medium of extremely small portions of a material substance existing on their own, and of their sensible qualities, happens over an extended interval of time, so that (potentially) infinite small portions of such material substance, together with their sensible qualities, exist at least for an instant of time, Jandun, who thoroughly subscribes to an instantaneous view of substantial change, bases his position on the idea that the threshold of corruptibility of extremely small portions of material substances (and of their sensible qualities) is inferior to the threshold of their perceptibility. This allows him to claim that there is in nature a certain "size-range" within which portions of material substances existing on their own retain their sensible qualities,

without, however, that these sensible qualities possess the power to act on the senses so as to engender a sensation. As Jandun puts it, such sensible qualities are therefore *insensibiles*, not, however, *insensibiles omnibus modis*.

Indeed, Jandun, taking advantage of the third meaning of potentially perceptible and of its interpretation by Alexander, is adamant in stating his belief that no entity existing on its own in the natural world is "imperceptible" in an *absolute* sense. Indeed, any portion of a material substance too small to be perceptible in act on its own can become perceptible in act (more precisely, its sensible qualities can acquire the power to be perceived in act) by uniting with a sufficient quantity of a material substance endowed with the same sensible qualities. Jandun, therefore, consciously develops a "corpuscularian" model of the production and of the mereological structure of sensible qualities that goes far beyond what his predecessors had claimed in this respect. Indeed, it should always be remembered that the sensible qualities existing on their own in the actual world without being perceptible in act admitted by Brito and the other commentators analysed above come to exist only during the process of corruption of extremely small portions of material substances, whereas Jandun's sensible qualities existing on their own in the actual world without being perceptible in act have a permanent existence, being able to resist to the corrupting action of the containing medium.

More than this, Jandun also shows to be fully aware of the "corpuscularian" implications of his innovative conceptual model, so much so that he closes his discussion on *minima sensibilia* by comparing it with Democritus' atomism. Referring back to Aristotle's criticism of Democritus' theory of the formation of middle colours in *De sensu* 3, Jandun shows that, on his model, contrary to Democritean atomism, what the senses perceive always corresponds to the "ultimate" structure of the perceived substance. That is to say, while, according to Democritus, there is always a level of reality that escapes perception (ultimately, the one of atoms themselves), on Jandun's conceptual model the sensible qualities that the senses perceive always correspond to the ones possessed by their "ultimate" components in the material substance being perceived. In this way, while Jandun's model denies the validity of the Aristotelian principle of the coextension of the sensible world and of the perceptible one in the actual world, it retains Aristotle's optimistic epistemological outlook on the nature of our sensations.

4.3. Jandun's Contemporaries on *Minima sensibilia*: Two Cases of Close Proximity

4.3.1. A *Complexe Question-Réponse*?

John of Jandun's position did not develop in a vacuum. Indeed, the two anonymous commentators who wrote the *De sensu* commentaries preserved, respectively, in ms. Paris, BnF, Lat. 16160, ff. 109r-118v[852], and ms. Oxford, Oriel College, 33, ff. 192r-197v[853] present a position on *minima sensibilia* that has close affinities with Jandun's one. While it is impossible to establish a precise date for the latter commentary, probably to be dated to the 1310s (or even to the 1320s), the situation is different for the former, insofar as the manuscript preserving it should be dated, according to the information contained in it, before 1310[854]. If this is so, the evident resemblances (which do not, crucially, take the form of explicit quotations) between the two commentaries (Jandun's one and the anonymous commentary of ms. BnF Lat. 16160), together with the fact that they might be dated to almost the same years (Jandun's commentary to 1309, according to the date reported in the *colophon* of ms. Vat. Lat. 6768, and the anonymous one of ms. BnF Lat. 16160 some years before 1310), might suggest that the two commentaries, rather than showing the direct influence of one upon the other, both belonged to a wider debate that was evidently going on around 1310 at the Parisian

[852] A list of *quaestiones* of the whole commentary is provided in EBBESEN, THOMSEN THÖRNQVIST, DECAIX, "Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue", *op. cit.*, pp. 74-76. Q. 4, *Utrum visus plus conferat ad scientiam quam auditus*, and q. 5, *Utrum surdi a nativitate sunt muti naturaliter* of the commentary have been edited in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 157-161. Q. 35, *Utrum unus sensus possit simul contraria*, q. 36, *Utrum sensus sentiens diversa sensibilia simul ipsa sentiat una sensatione vel pluribus*, and q. 37, *Utrum sensus communis sit unus sensus*, of the commentary, have been edited in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 181-188.

[853] A list of *quaestiones* of the whole commentary is provided in EBBESEN, THOMSEN THÖRNQVIST, DECAIX, "Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue", *op. cit.*, pp. 78-79. Q. 5, *Utrum surdus a nativitate sit mutus* has been edited in S. EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 174-177. For some remarks on the manuscript preserving the commentary, and for an edition of a commentary on the *De memoria* preserved in the same manuscript and probably by the same author, cf. ID., "Anonymus Orielensis 33 on *De memoria*. An Edition", *Cahiers de l'Institut du Moyen-Âge Grec et Latin* 85, 2016, pp. 128-161.

[854] On the first folio of the manuscript, indeed, it is stated that it had been donated to the library of the College of Sorbonne by Nicolaus de Barroducis (Nicolas de Bar-le-Duc), who is known to have died in or around 1310. Cf. ms. Paris, BnF Lat. 16160, f. 1r: "In hoc volumine continentur questiones super librum *Phisicorum*, *De celo et mundo*, *De sensu et sensato*, *De memoria et reminiscentia* et quedam alia ex legato magistri Nicolai de Barroducis".

Faculty of Arts, therefore, if anything, showing the common influence of such debate (at the limit, of specific sources) upon both of them. Indeed, although, as it will become clear below, Jandun's analysis is far more detailed and extended than the one contained in the anonymous commentary of ms. BnF Lat. 16160, the structure of their discussions of *minima sensibilia*, the arguments employed, and (although only partially) the solution provided to the issue are rather analogous in the two commentaries.

If this is so, then, it might be reasonable not only, generically, to read these two commentaries as part of a wider debate taking place in the same years at the Parisian Faculty of Arts, but, more specifically, to consider their discussions of *minima sensibilia* as a useful example of what Alain de Libera, following R. G. Collingwood, has labelled *complexes question-réponse* ('complexes of question and answer'), which he takes to constitute, to a large extent, the proper object of study of the historian of Scholastic philosophy (more than the inevitably more generic notion of 'problems')[855]. As de Libera understands the notion, a *complexe question-réponse* is a collection of propositions belonging to an identifiable *corpus* (in this case, *De sensu* question commentaries) that satisfies three conditions. Firstly, every question and every answer in the collection must be pertinent or appropriate, finding its suitable place not only in the whole to which it belongs but also in the specific part of it where it appears. Secondly, every question must have been posed within the *corpus*. Thirdly, and finally, there must be a direct correspondence between questions and answers within each part of the *corpus*, so much so that every answer is the correct answer to the question it addresses[856]. In this context, the *complexe question-réponse* would be constituted, at the least, by the following elements: an explicit discussion, within a separate *quaestio* from the traditional one

[855] Cf. A. DE LIBERA, "Le relativisme historique: théorie des « complexes questions-réponses » et « traçabilité »", *Les Études philosophiques* 4, 1999, pp. 479-494, esp. pp. 486-494.

[856] Cf. DE LIBERA, "Le relativisme historique: théorie des « complexes questions-réponses » et « traçabilité »", *op. cit.*, p. 486, n. 2: “Pour q'une collection d'énoncés donnés dans un corpus puisse être considérée comme un CQR [i.e., Complexe question-réponse], rappelons qu'il lui faut satisfaire trois conditions: 1/Toute question et toute réponse doit, dans un complexe, être pertinente ou appropriée; chacune doit à la fois « appartenir » au tout et à la place qu'elle occupe dans le tout; 2/Toute question doit « s'être posée »; 3/Toute réponse doit être « la réponse correcte » à la question à laquelle elle prétend répondre.” Note that here de Libera makes reference to Collingwood's *Autobiography* as a source of inspiration for his notion of '*complexes question*-réponse' (cf. R.G. COLLINGWOOD, *An Autobiography and Other Writings. With Essays on Collingwood's Life and Work*, D. BOUCHER, T. SMITH (eds.), Oxford, Oxford University Press, 2014, p. 37). More generally, the fifth chapter of the autobiography is crucial for the presentation of Collingwood's "logic of question and answer", i.e., the idea, at the basic level, that every proposition in the history of philosophy (and in intellectual history more general) can only be understood by understanding what question it was meant to answer.

concerning whether sensible qualities are infinitely divisible, of the issue of the possibility of the existence of sensible qualities that are not perceptible in act, having as a standard (and appropriate) argument Averroes' one from the *Long Commentary* on *Metaphysics* Θ, as a question to be necessarily asked whether a form (in this case, that of a sensible quality) can exist without having the power to perform its proper operation, and, as the correct answer to it, that it can, insofar as the power to perform its proper operation is possessed by a given form (and must be possessed by a given form for it to be the entity that it is) only when such form is present in a sufficient quantity of matter.

As it will appear below, all these fundamental elements, which were all present in Jandun's commentary (but also, in an embryonic form and not as part of a separate *quaestio*, in Brito's commentary and in those of ms. Vat. Lat. 2170 and ms. Vat. Lat. 3061), feature prominently also in the commentary of ms. BnF Lat. 16160. Still, this should not overshadow the specificities of both commentaries. Indeed, as I will now go on to show, the commentary of ms. BnF Lat. 16160 has an important number of features that clearly distinguish it from Jandun's one, even within the framework of the same *complexe question-réponse*.

4.3.2. The Position of the Anonymous Commentary of ms. BnF Lat. 16160 on *Minima sensibilia*: Jandun in the Mirror?

The proximity of the anonymous commentary of ms. BnF Lat. 16160 with Jandun's commentary, as mentioned above, is already discernible in the fact that both commentaries discuss the issue of *minima sensibilia* in two *quaestiones*, the first one being of the traditional form *Utrum qualitates sensibiles sint divisibiles in infinitum*, the second one concerning the possibility of the existence on their own of sensible qualities that are not perceptible in act (a *quaestio* that, for the topics discussed, is mostly the theoretical equivalent of q. 29 of Jandun's commentary).

For what concerns the first *quaestio*, which is q. 32 of the commentary, *Utrum divisio qualitatum sensibilium sit in infinitum*, the proximity with Jandun seems to be recognisable in at least one element. Indeed, the commentator, in agreement with Jandun but contrary to Brito and to the two anonymous authors of the commentaries of ms. Vat. Lat. 2170 and of ms. Vat. Lat. 3061, does not accept the superposition of the distinction

between the divisibility of a continuous entity in a (potentially) infinite number of unequal parts and in a finite number of equal parts with the distinction between the imaginative (potentially) infinite divisibility *per accidens* of sensible qualities in parts existing potentially within a given whole and their (finite) real divisibility *per accidens* according to the actual separation of such parts from the whole to which they belong. Rather, in agreement with Jandun, he takes both kinds of divisibility *per accidens* of sensible qualities, insofar as they are discussed by Aristotle, to refer to the case of the divisibility of a continuous entity in unequal parts, insofar as the division of a continuous entity in equal parts, being a finite process, does not raise any issue concerning the infinite divisibility *per accidens* of sensible qualities[857].

The presentation of Aristotle's solution is rather "traditional", and certainly in line both with Jandun's own one and with those of Brito and the two anonymous commentators of ms. Vat. Lat. 2170 and ms. Vat. Lat. 3061: while the (imaginative) division *per accidens* of sensible qualities according to the (imaginative, although, contrary to Jandun, this is not said by the commentator) division of the parts existing in a given sensible whole goes on to infinity, the real separation of the parts of that same sensible whole and of its sensible qualities stops at a *minimum*[858].

The two arguments adduced to support the existence of a *minimum* in parts separate from the whole to which they belong and in their qualities are also quite "traditional", although their brachilogical formulation makes them difficult to be discerned clearly. Indeed, the usual Aristotelian argument of 446a7-10 concerning the corruption of extremely small portions of matter and of their sensible qualities by the containing medium is supplemented by an argument in which the appeal to the existence

[857] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 32, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 117ra: "Si queras utrum divisio qualitatum que est secundum subiectum sit in infinitum, tunc dico quod illud continuum quod est subiectum potest dividi in equales partes vel in inequales. Si in partes equales, dico quod continuum non divideretur in infinitum et per consequens neque qualitates, quia illud continuum cum sit finitum per ablationem partium equalium tandem consumitur. Si autem dividatur illud continuum in partes inequales eiusdem proportionis, tunc distinguo, quia ille partes possunt accipi ut sunt in toto vel ut sunt separate a toto."

[858] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 32, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 117ra: "Si primo modo [i.e., by dividing in imagination the parts of a sensible whole that exist within it], sic divisio continui procedit in infinitum, quia non est dare ita minimam <partem>, sicut ut est in toto, quin sit dare minorem, quia divisio continui procedit in infinitum. Modo qualitates sensibiles sunt coextense cum toto continuo. Ergo non erit [...] minima pars continui quin insit qualitas sensibilis. Et sic divisio illa procedet in infinitum. [...] Si autem tunc accipias divisionem ut dividitur in partes separatas a toto, tunc dico quod non erit in infinitum, [...]."

of *maxima* and *minima* in material substances is formulated in an apparently peculiar way. Indeed, the commentator explicitly declares that "the sensible form demands a determined quantity in which it is preserved, and in a smaller [one] and in a greater [one] it would not be preserved (*forma sensibilis exigit quantitatem* (ms. *formam*) *determinatam in quam salvatur, et in minori et in maiori non salvaretur*)[859]". This way of framing what, by the early 14th century, had become a customary argument to adduce in support of Aristotle's doctrine of *minima sensibilia*, is unusual. Yet, upon closer scrutiny, there is no reason to think (and the unfolding of the discussion will confirm it) that this is a rather short and obscure way to claim that the *minima* (and *maxima*) of material substances correspond to the minimal (and maximal) quantity in which the substantial forms themselves are able to perform their proper operation. This minimal quantity, supposedly, should also be taken as the minimal one in which the substantial form is able to counter the corrupting action of the containing medium, in agreement with the other argument presented by the commentator in support of the existence of minima in the portions of material substances separated from the whoel to which they belong (according to the "traditional" formulations seen in this and in the previous section).

After the *responsio ad rationem*, that does not add much of value to the discussion, the commentator inserts a second *quaestio* related to *minima sensibilia*, according, as said, to a use that is in common with Jandun. The *quaestio*, q. 33 of the commentary, asking about the existence on their own of sensible bodies (and therefore of their sensible qualities) that are not perceptible in act due to their smallness (*Utrum sit dare aliquod sensibile ita parvum quod numquam immutet sensum*), seems to share many of the concerns that played a significant role especially in q. 29 (but also in q. 30) of Jandun's commentary, although they are discussed in a much shorter way.

Indeed, the *quaestio*, opening with the arguments *quod non*, lists as the first of them Averroes' argument, quoted alongside an Aristotelian *auctoritas* from the *Meteorologica*:

[859] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 32, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 117ra: "[...] quia oportet ita dare minimam partem que in esse suo per se non poterit salvari, sed in [in] continens resolvetur, ut modicus sapor infusus mari. Item, formam sensibilis exigit quantitatem (ms. formam) determina[n]tam in qua salvatur, et in minori et in maiori non salvaretur. Ergo in qualitatibus sensibilibus erit devenire ad maximum et minimum; quare etc."

> It is argued that [this is] not [the case], because, first, any being whatsoever has one proper operation, in which, insofar as [the being] can perform [it], it is called that [which it is], when, however, [it] cannot, it is not called that [which it is] if not equivocally, according to *Meteorologica* Book IV. But the proper operation of a sensible [being] is [that of] moving the sense; therefore etc. And the argument is confirmed [in this way]: "[he] who takes away from beings their [proper] operations takes away their forms", such as Averroes says in *Metaphysics* Book XII; for this reason such [a being] that cannot be perceived will not be sensible[860].

The two *auctoritates* referred to are the same (and in the same order in which they are quoted here) that are also present in the last argument in favour of the idea that sensible qualities can exist on their own in the actual world without being perceptible in act presented by Jandun in q. 30. The passage as a whole, indeed, is extremely similar to the corresponding one of Jandun's commentary, and I think that it is worth looking at them together:

Jandun, q. 30, f. 20va	Ms. Paris, BnF, Lat. 16160, q. 33, f. 117rb
Item, nihil potest esse sine operatione propria, ut vult Aristoteles in quarto *Meteorum* et Commentator nono *Metaphysice*. Sed operatio propria qualitatis primae vel secundae est movere sensum, ergo potest nihil esse informatum aliqua qualitate prima aut secunda quin possit movere sensum.	Arguitur quod non, quia, primum, unumquodque ens habet unam propriam operationem, in quam cum potest dicitur id, cum autem non, non dicitur nisi equivoce, quarto *Metheorum*. Sed propria operatio sensibilis est movere sensum; ergo etc. Et confirmatur ratio: *qui tollit ab entibus suas operationes tollit formas suas*, ut dicit Commentator duodecimo (*sic!*) *Metaphyisice*; quare tale quin (*ms.* quid) sentiri potest non erit sensibile.

The major difference between the two passages is certainly the fact that the author of the commentary of ms. BnF Lat. 16160 mistakenly refers to Averroes' argument as coming from the *Long Commentary* on Book Λ, instead than from that on Book Θ, of the *Metaphysics*. The fact that he, however, is undoubtedly referring to the same passage as Jandun is proved by the way in which he quotes it. Indeed, his formulation, *qui tollit ab entibus suas operationes tollit formas suas*, is extremely simlar to Jandun's own

[860] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 33, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 117rb: "Arguitur quod non, quia, primum, unumquodque ens habet unam propriam operationem, in quam cum potest dicitur id, cum autem non, non dicitur nisi equivoce, nono *Metaphysicorum*. Sed propria operatio sensibilis est movere sensum; ergo etc. Et confirmatur ratio: *qui tollit ab entibus suas operationes tollit formas suas*, ut dici Commentator duodecimo *Metaphyisice*; quare tale quin (*ms.* quid) sentiri potest non erit sensibilis."

formulation in his first presentation of the argument in q. 29 (*qui tollit operationem tollit essentiam*[861]).

After this first argument, however, the author of the commentary of ms. BnF Lat. 16160 also adds a second one against the idea that sensible qualities can exist on their own without being perceptible in act. The argument is a rather peculiar one, which does not find a direct comparison in Jandun's commentary:

> Moreover, any sensible whatsoever, however small, has the power to act on the sense, and therefore it will act on the sense; and you say that it is true on the part of the sensible, not on the part of the sense. Against, because in *Metaphysics* Book IX [Aristotle says that] a passive power corresponds to an active [one], therefore if there is to posit on the part of the sensible an active potency, it will be posited a passive one on the part of the sense; therefore etc[862].

The beginning of the argument seems to be the result of an inference drawn from the previous one: since a form cannot exist without the power to perform its proper operation, and since the proper operation of the accidental form of a sensible quality is that of acting on the corresponding external sense, then the form of a sensible quality will have the power to act on the corresponding external sense even when united to an extremely small quantity of matter.

Still, after this first passage the commentator inserts an interesting objection: someone might indeed want to claim that this is certainly true for what concerns the action of the form of any sensible quality, but still such an action (in the case of sensible qualities united to extremely small portions of matter) will not manage to have an effect on the corresponding external sense, given the limitations of sensory powers in nature. This objection, and especially the distinction *ex parte sensibilis-ex parte sensus*, regarding the ability of a sensible quality to act on the corresponding external sense, is rather peculiar in the Parisian commentary tradition, and it seems, rather, to be closely reminiscent of the Oxford *De sensu* commentary tradition and especially of its doctrine of *minima secundum sensum*, which, as I have shown in the previous chapter, was still a legitimate position

[861] Cf. IOANNES DE JANDUNO, *Quaestiones super De sensu et sensato*, q. 29, Venetiis 1557, f. 19vb.
[862] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 33, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 117rb: "Item, quodcumque sensibile quantumcumque parvum habet potentiam (*ms.* formam) immutandi sensum, et ideo immutabit sensum; et tu dices quod verum est quantum ex parte sensibilis, non quantum ex parte sensus. Contra, quia nono *Metaphysice* potentia passiva correspondet active, ergo si sit dare ex parte sensibilis potentiam activam (*ms.* passivam), erit dare activam (*ms.* etiam) ex parte sensus; ergo etc."

around the turn of the century in England (such as in the case of the commentary of ms. Merton 276). Its insertion here seems to indicate that this position was also circulating in Paris at the same time, although not finding any known adherent there.

What is even more interesting, however, is the way in which the commentator replies to it. Indeed, he resorts to the argument, drawn in this case from *Metaphysics* Θ, according to which to any active power in nature must correspond a passive one, and since the senses are the passive powers corresponding to the active powers of sensible qualities, to the active power of any sensible quality existing on its own must correspond the passive power of a sense. The reference to the correspondence between active and passive powers in sense perception in the context of the debate on *minima sensibilia* is not an uncommon choice for the commentator. Indeed, both the commentary of ms. Vat. Lat. 2170 and, although in a much more reduced way, the commentary of ms. Vat. Lat. 3061, had already had recourse to such a reference. Nevertheless, the way in which this aspect is introduced in this commentary might suggest that the issue of the correspondence between active and passive powers in sense perception could have been used as an argument to counter the view of *minima secundum sensum*. Still, lacking any other example of this use of this reference, it remains ultimately impossible to ascertain whether this was just a peculiar choice on the side of the author of the commentary of ms. BnF Lat. 16160 or, rather, an instance of a more general trend.

The argument presented by the commentator in favour of the idea that a sensible quality can exist on its own without being perceptible in act is, however, no less surprising. Indeed, the commentator claims that this was Aristotle's view[863]. This fact appears to be, at first glance, absolutely remarkable. Nevertheless, by looking at the way in which the commentator goes on to develop his solution, it appears rather clearly that what he wants to claim is, referring to *De sensu* 6, 446a10-15, that Aristotle explicitly admitted that there are in a sensible whole parts so small so as to be incapable to act on the senses on their own, and that, if such parts could exist on their own (that is, without being corrupted by the action of the containing medium), they would not be perceptible in act.

[863] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 33, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 117rb: "Oppositum dicit[ur] Philosophus, quia numquam tale minimum immutabit sensum."

Does the commentator believe that such parts can exist on their own, in the actual world? The answer to this difficult question lies in the following passage, with which the commentator introduces his solution:

> And assuming that (*dato quod*) [a sensible quality united to an extremely small portion of matter] can exist without this, [i.e., the fact] that [it] is resolved in the containing [medium], I say according to Alexander's intention that it is [possible] to reach [by division] some sensible that will not act on the sense by itself, although, however, it can act [on the sense][864].

The interpretation of the passage is extremely difficult, given its brevity and the fact that it leaves much unsaid. Nevertheless, the wording used by the commentator, especially the initial *dato quod*, seems to imply that it is not possible that, in the actual world, there can be sensible qualities existing on their own without being perceptible in act. At the very least, it seems that the commentator is only discussing this hypothesis as a conceptual possibility, as I have already said, whose instantiation in the actual world remains something to which he is not explicitly committed. If this is so, then, the commentator seems to take a step back when compared with Jandun, and also with the commentators discussed in the previous section. Moreover, the commentator supports his view by referring to Alexander, who is here taken, however, to be supporting the mere conceptual possibility of the existence of sensible qualities on their own that are not perceptible in act (and not their existence in the actual world, as it was in Jandun).

Of course, again, the text is too short to allow to make any definitive decision concerning its interpretation. Still, if this interpretation were correct, it would contribute to show that, at the Parisian Faculty of Arts at the beginning of the 14th century, the belief in the existence in the actual world of sensible qualities that are not perceptible in act was still an extremely controversial position, whose acceptance by Jandun seems to constitute a rather isolated case among his contemporaries (although one which finds its origins in commentaries such as Brito's one and those of ms. Vat. Lat. 2170 and ms. Vat. Lat. 3061). In any case, the commentary at hand shows a rather significant distance from Jandun's commentary in other respects.

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[864] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 33, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 117rb: "Et dato quod possit esse absque hoc, quod resolvitur (?) in continens, dico secundum intentionem Alexandri quod est devenire ad aliquod sensibile quod non secundum se sensum immutabit, licet tamen possit immutare."

Indeed, when it comes to providing a reply to Averroes' argument, the commentary of ms. BnF Lat. 16160 takes a very different route from Jandun's one. In this case, the commentator seems to be rather in line with the positions taken by previous commentators such as Brito and the two anonymous authors of the commentaries preserved in the Vatican manuscripts than with Jandun's one[865]. As a matter of fact, he limits himself to claim, in a rather generic way, that "the operation does not proceed from the form until that [substance, in which the form inheres] is under a determined quantity (*operatio non procedit a forma quo<us>que illud sit sub determinata quantitate*)[866]". The commentator's idea is, therefore, that Averroes' argument is only valid for what he calls "perfect entities" (*de entibus perfectis*), that is, only for those material substances that are sufficiently great that their substantial and accidental forms have the power to perform their proper operation[867]. It must be remarked in this respect that the reference to the fact that the only perfect entities are those whose forms have the power to perform their proper operation is a formulation that comes partially close to the commentary of ms. Vat. Lat. 3061, where, as I have shown above, it was explicitly claimed that the power to perform its proper operation is the *ultima potentia* of a given form, by an appeal to an *auctoritas* from *De caelo* I.

The same generic appeal to the fact that a certain quantity of matter is required in order for a form to have the power to perform its proper operation is also used by the commentator to reply to the argument concerning the correspondence between active and passive powers in sense perception. Here, however, the recourse to the principle that the power to perform its proper operation only belongs to a form when it is present in a sufficient quantity of matter is mentioned as a *possible* reply to the argument. The

[865] Although, of course, also Jandun shares this same basic position, but, as shown above, he also goes far beyond it to provide a far more refined conceptual model in this respect.

[866] The full passage is the following one: "Et alia ratione, quia operatio non procedit a forma quo<us>que illud sit sub determinata quantitate. Unde videndum de yntellecto, quia non intelligit <nisi> perfecto, nec ratiocinatur vel per <se> considerat quousque sit in de<term>i<na>ta quantitate. Ergo contingit devenire ad aliquod sensibile in ta<n>ta quantitate quod non habeat quantitatem debitam nec poterit immutare sensum. Ergo etc." (ANONYMUS, *Quaestiones super De sensu et sensato*, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 117rb). The example of the intellect is also an aspect that might draw this commentary close to Jandun's one, since, as I have shown above, also Jandun had recourse to the proper operation of the intellective soul in his discussion of the quantity of matter required for the accidental form of sensible qualities to have the power to perform their proper operation.

[867] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 33, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 117rb: "Ad primam (sc. rationem), "unumquodque". Verum est de entibus perfectis qui sunt sub perfecta quantitate, et non de aliis."

commentator, indeed, introduces it only after having presented another possible reply to it. This reply is based on a clearly "corpuscularian" formulation (an aspect, as said, entirely absent from the commentators discussed in the previous section) based on the idea that to an active power always corresponds a passive one, either when the active power exists by itself or when it exists in a greater whole[868]. This latter formulation, significantly, also allows to preserve the relational character of sensible qualities (and of their active power towards the senses specifically) to a higher degree than the formulation adopted by the authors of the commentary of ms. Vat. Lat. 2170 and ms. Vat. Lat. 3061.

4.3.3. The Anonymous Commentary of ms. Oxford, Oriel College, 33, ff. 192r-197v: Combining the Oxford Tradition on *Minima sensibilia* with the Parisian Debate

Another commentary that is certainly close to Jandun's one and to the anonymous one of ms. BnF Lat. 16160 is the commentary of ms. Oxford, Oriel College, 33, ff. 192r-197v. In this case, however, a preliminary discussion concerning the origin of the commentary is in order. Contrary to the last commentary analysed, indeed, it is unclear whether this commentary belongs to the Parisian commentary tradition or to the Oxford (or, more generally, English) one. Although the manuscript in which the commentary is preserved is certainly of English origin, the commentary itself shows a clear influence of the early 14th-century Parisian commentary tradition on the issue of *minima sensibilia* (such as the fact that, on the structural level, as said, the commentary, like the one of the ms. BnF Lat. 16160, discusses the issue in two *quaestiones*, the first one being the traditional one, and the second one concerning specifically the hypothesis of the existence on their own of sensible qualities that are not perceptible in act, therefore basically the same topic of q. 29 of Jandun's commentary). Nevertheless, at the same time, the

[868] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 33, ms. Paris, Bibliothèque nationale de France, Lat. 16160, f. 117rb-va: "Ad aliam, quod habet potentiam activa<m> |f. 117va| ergo et potentiam passivam sibi corrispondentem (*ms.* corrumpentem), dico quod habebit potentiam passivam sibi corrispondentem (*ms*. corrumpentem) non secundum se existens, sed ut [sed ut] in alio erit, scilicet in toto. Et tu dicis "illud est sensibile, et ideo oportet quod sentiatur secundum se sensibile"; dico quod istud est sensibile quia habet potentiam sensibilem, sed non habet debitam quantitatem, ideo etc. Vel potest dici "cuilibet potentie active" etc.; dico quod verum est quod cuilibet potentie active correspondet passiva vel secundum se, vel coniuncta cum alio, et non oportet quod secundum se in primo modo, dico licet habeat illi potentie active istius sensibilis minimum secundum se non respondeat passiva potentia, respondet tamen ut coniunctam cum alio, et hoc sufficit, vel potest dici quod cuilibet active potentie correspondet passiva si sit sub debita quantitate, si autem non, <non> oportet, et sic ad illud."

commentary also shows some important features in common with the Oxford commentary tradition[869], such as the fact that the sensible qualities perceptible in act on their own are defined as sensibles *actione*, while the ones which are only perceptible (potentially, in the first sense) as part of a greater whole are defined as sensibles *virtute*. The use of this terminology, and also the meaning given to it by the commentator, is indeed rather close to what is found in the commentary of ms. Merton 276, where the notion of sensibles *virtute* tends, although in a far less elaborated theoretical framework, to translate the notion of *minima secundum sensum*, the same one already present in Bacon's *Liber de sensu*. The most likely hypothesis that all these observations suggest (based, however, on the mere analysis of the commentary's discussion of *minima sensibilia*, and therefore to be supplemented by a complete analysis of the contents of the commentary) is that the commentary belongs to an Oxford master who was educated in Oxford but who later either moved to Paris or was, in any case, strongly influenced by the contemporary commentary tradition of the Parisian Faculty of Arts[870].

The *determinatio* of the first *quaestio*, q. 26 of the commentary, by all evidence of the traditional type *Utrum qualitates sensibiles sint divisibiles in infinitum*[871], starts by classifying the kinds of division discussed by Aristotle throughout the text. Similarly to (although less explicitly than) both Jandun and the author of the commentary of ms. BnF, Lat. 16160, the commentator starts by distinguishing between the division of matter in equal and unequal parts and the division *per accidens* of sensible qualities in equal and unequal parts. However, differently from both Jandun and the commentary of ms. BnF Lat. 16160, the commentator seems to be thinking of all these divisions as being performed via the real separation of parts, and not merely in imagination. As a consequence, in order to be able to claim that, when the sensible qualities of a given

[869] Features that suggest, in any case, to avoid considering the discussion of *minima sensibilia* in such a commentary part of the same *complexe question-réponse* than Jandun's one and the one of the commentary of ms. BnF Lat. 16160.

[870] Of course, whether one or the other of the two hypotheses is more likely depends, to a large extent, on the exact date of composition of the commentary. Evidently, if one assumes a date of composition before ca. 1320, the most likely way for an Oxford master to become acquainted with debates having taken place at Paris around 1310 is a physical stay in Paris, whereas, the more one moves towards 1330 or even beyond, the easier it becomes to assume that he could have simply become acquainted with the Parisian debate having taken place around 1310 by the mere circulation of manuscripts.

[871] Note that the exact title of the *quaestio* is impossible to determine, because, between f. 196v and f. 197r one folio is missing from the manuscript, and the title of the *quaestio* (together with the first lines of it) was written on such folio. Fortunately, almost all the first *quaestio* on *minima sensibilia* (and certainly the whole *determinatio*) belongs to the extant part of the manuscript.

material substance are separated (*per accidens*) in unequal parts, the division is potentially infinite, the commentator has to claim that this happens only once the corrupting action of the containing medium has been taken away from the scenario (*remoto corrumpente extrinseco*)[872]. It is clear from this first remark, and it will also be confirmed by the unfolding of the discussion, that the commentator is fully committed to the idea that all the accidental forms of sensible qualities that are not perceptible in act existing on their own in the actual world are corrupted by the action of the containing medium (an action which can be considered as non-existing only in a possible world), a belief that runs against Jandun's own conviction while, probably, is shared by the commentary of ms. BnF Lat. 16160. Before, however, getting to the discussion of what would happen in the absence of the corrupting action of the containing medium, an issue which is addressed more directly in the following *quaestio*, the commentator goes on to detail his belief in the existence in the actual world of *minima* (*sensibilia*) *secundum corruptionem*. These *minima*, however, according to what the commentators analysed in this and in the previous sections believed (including, I think, also the author of the commentary of ms. BnF Lat. 16160), are identified not merely as the minimal quantities of matter in which substantial forms can resist to the corrupting action of the containing medium, but also as the minimal quantities of matter in which such forms have their "power", which I take to be the power to perform their proper operation:

> The opposite [i.e., that the division *per accidens* of sensible qualities in unequal parts would not be infinite even in the absence of the corrupting action of the containing medium] <is argued> because the nature of all the constant entities is such, and therefore of [their] magnitude and augmentation, but natural entities have determined properties and passions, so [they] require determined quantities. Hence one is the quantity so great in which, or beyond which, the human power is not found, and another is [the quantity] so small below which [the human power] does not persist. Hence if a natural body is divided, ultimately a quantity unproportional or unproportioned to its subject is reached. And therefore, if a contrary containing

[872] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 26, ms. Oxford, Oriel College, 33, f. 197ra: "Divisio vero accidentalis potest fieri dupliciter, sicut et divisio corporis in quo sunt sensibilia. Uno modo potest fieri per partes equales, et hoc non procedit in infinitum, quia si a corpore quantitativo videtur auferri pars pedalis tandem contingeret totum corpus consumari. Si vero divisio fiat in partes inequales secundum quantitatem, eiusdem tamen proportionis, divisio corporis ibit in infinitum, ut si corpus pedale dividatur in tres partes, et tertia pars illius in tres, et tertia pars illius in tres, et procederet in infinitum. Sic est in divisione qualitatum sensibilium. Si nam aliquod sensibile ut color [...] dividatur per accidens in parte<s> equales in quantitate, ista divisio tandem est determinata. Si autem fiat divisio in partes equales <secundum proportionem>, remoto corrumpente extrinseco, procedet divisio in infinitum, ut si corpus album divideretur, et non esset exterius corrumpens, immo ipsius corporis et (*ms.* nec) ipsius albedinis quelibet pars est alba."

> [medium] exists, immediately it is transformed into its matter, and the reason of this is because in a smaller magnitude there is a smaller power and smaller entities are corrupted more easily, according to Aristotle in this book *De longitudine et brevitate vitae* [cap. 2]. Hence, even if a [quantity] of earth of one fist could resist to the heatness of the same air for a certain <time>, still this earth could be divided so that it will be reached a certain part which cannot resist to the corrupting air. And then necessarily this part will be transformed into air. Hence the real division (*divisio realis*) of sensible [qualities] in parts separated [from the whole to which they belong] does not go on to infinity, because these separated parts will have a certain external corrupting [agent][873].

An interesting aspect of the passage that it is important to remark (and that might also suggest a connection with Jandun's commentary) is the fact that the example taken by the commentator is that of the *virtus humana*, that is, of the human ratiocinative power, as an example of the power of a substantial form to perform its proper operation. Still, the commentator does not use the same example with reference to the problem of the possibility for the essence of a given entity to persist when it is not able to perform its proper operation, as Jandun, as seen, did.

It is only after this discussion that the commentator introduces the second *quaestio* related to *minima sensibilia*, q. 27 of the commentary (*Utrum aliquid sit ita sensibile virtute quod non est sensibile active*), just like the commentary of ms. BnF Lat. 16160. The *quaestio*, as said, is substantially analogous, asking whether there could exist (as a mere conceptual possibility) something which is sensible (by essence) without being perceptible in act. The *quaestio*, however, as I have mentioned, is formulated by using a lexicon typical of the Oxford commentary tradition, namely, as asking whether there could be something that is sensible *virtute* which is not at the same time sensible *actione*. However, to the lexical difference, as I will show in what follows (and as I have already partially anticipated), corresponds also a substantial theoretical difference, a difference

[873] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 26, ms. Oxford, Oriel College, 33, f. 197ra: "Oppositum <arguitur> quia omnium natura constantium talis est, et ideo magnitudinis et augmenti, sed naturalia determinatas habent proprietates et passiones, sic determinatas requirunt quantitates. Unde alia est quantitas ita magna in qua vel ultra quam non invenitur virtus humana et alia est ita parva infra quam non consistit. Unde si corpus naturale dividatur, tandem est devenire (*ms.* demonstrare) <ad> quantitatem inproportionalem vel inproportionatam sui (*ms.* sue) subiecti. Et ideo continente existente contrario statim in materiam ipsius mutabitur, et huius ratio est quia minor virtus est in minori magnitudine et minora facilius corrumpuntur, per philosophum in hoc libro *Longitudinis et brevitatis vite*. Unde et si terra unius pugilli possit resistere caliditati ipsius aeris in tantum <tempus>, tamen possit ista terra dividi <sic> quod est accipere aliquam partem qui aeri corrumpenti resistere non possit. Et tunc necessarie (*ms.* necessario) mutabitur ista pars in aerem. Unde divisio realis sensibilium in partes separatas non procedit in infinitum, quia iste partes separatas habebunt aliquod corruptivum extrinsecum."

that brings the *quaestio*, while bearing an undeniable trace of the contemporary Parisian debates, closer to the conceptual horizon which is found, for instance, in the commentary of ms. Merton 276. Indeed, it will become clear from the discussion that, exactly as the commentator of ms. Merton 276, also the commentator of ms. Oriel 33 conceives of both sensibles *virtute* and sensibles *actione* as sensible entities in which the accidental forms of sensible qualities are able to act (therefore both as being sensibles *secundum actionem*, to use Aspall's terminology), only with the difference that, to resort again to Aspall's lexicon, sensibles *virtute* are those which possess a mere *actio inclinans* (an action that does not achieve its effect), whereas sensibles *actione* are those that possess an *actio inclinans et consequens effectum* (an action that achieves its effect, in this case, that of producing a sensation). It is rather clear, instead, that the corresponding *quaestio* of the commentary of ms. BnF Lat. 16160 is based on the distinction between the accidental forms of sensible qualities that are "active" and, as such, that are able to produce a sensation, and those that are entirely "inactive", namely, that do not act at all, not even in the sense of Aspall's *actio inclinans*, insofar as they do not have the power to act[874]. This difference noted, however, the two *quaestiones* present important similarities both in terms of structure and of content.

The arguments presented by the commentator against the possibility of the existence of sensibles *virtute* which cannot become sensibles *actione* are three, and they only partially overlap with the ones used in the commentary of ms. BnF Lat. 16160 in the same respect. The first one, absent from the commentary of ms. BnF Lat. 16160 (but partially reminiscent of other passages of its discussion, as I will show below), is based on the idea that a sensible *virtute* is a perfect entity, insofar as it possesses the power to act (indeed, it is "active"), but a perfect sensible must necessarily be perceptible (and perceived) in act, that is, it must necessarily be sensible *actione*, else it would not be perfect anymore[875]. It is immediately clear why such an argument could not have found a place in the commentary of ms. BnF Lat. 16160 (or in any of the other Parisian

[874] Still, both the notion of qualities that are sensible only *virtute* of the commentary of ms. Oriel 33 and the notion of "inactive" sensible qualities of the commentary of ms. BnF Lat. 16160 entail the consequence that the sensible qualities concerned are not perceptible in act on their own, therefore I consider it legitimate to use this expression while analysing both commentaries.

[875] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 27, ms. Oxford, Oriel College, 33, f. 197rb: "Et videtur quod non, quia (*ms.* quod) talis est perfectum <qui> potest in suam actionem in sua specie, sed id quod est sensibile virtute est perfecte sensibile, nam virtus est perfectio rei, ergo quodcumque est sensibile virtute est sensibile actione."

commentaries analysed in this and in the previous section), since it is based on a conceptual couple that, as said, exclusively belongs to the Oxford discussion on *minima sensibilia*. Nevertheless, the argument is reminiscent of the commentary of ms. Vat. Lat. 3061's definition of the power to perform its proper operation, for a given entity, as its *ultima potentia*, and therefore the most perfect one (in that case the commentary quoted an *auctoritas* from *De caelo* I in support of such an idea, as said). More than that, the use of the notion by the commentator of ms. Oriel 33 also resembles the idea, mentioned by the commentary of ms. BnF Lat. 16160, that the entities that can perform their proper operation are *perfect* ones.

After this first argument, the commentator inserts a second one which is extremely interesting for the present thesis, and that I therefore quote in full:

> Moreover, the action makes the form known, such as transmutation (i.e., substantial change) [makes] matter (i.e., prime matter) [known], hence [he] who denies entities their actions and operations takes away from them their proper forms; [that] which, therefore, is not sensible in action (*sensibile secundum actionem*) does not have the form of sensibility, and the power comes from the form, thus it does not [have] the power of a sensible [entity][876].

The interest of the argument lies in the fact that it originally combines the two arguments drawn from Averroes' *Long Commentary* on the *Metaphysics* that had been previously used in the debate on *minima sensibilia*. The first one is the epistemological one, already used by Peter of Auvergne and drawn (although in a modified form) from Averroes' commentary on *Metaphysics* H, based on the analogy according to which, such as substantial change allows us to get to know the existence of prime matter, so the performance of its proper operation allows us to get to know the form of a given entity (substantial but, by extension, also accidental). The second argument is, instead, the more familiar ontological one taken from Averroes' commentary on *Metaphysics* Θ, according to which if an entity loses its proper operation, it necessarily also loses its form (substantial but also, again, accidental), insofar as proper operations are what ultimately distinguish, from an ontological point of view, a given form (a given essence) from

[876] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 27, ms. Oxford, Oriel College, 33, f. 197rb: "Preterea, actio facit scire formam, sicud transmutatio materiam, unde qui negat entibus suas actiones et operationes aufert ab eis suas proprias formas; quod ergo non est sensibile secundum actionem non habet formam sensibilitatis, et virtus proce<di>t a forma, ergo nec habet virtutem sensibilis."

another one. This argument, as seen above, had been central to Jandun's discussion in q. 29 and in q. 30 of his commentary, but it was also employed by the commentator of ms. BnF Lat. 16160. The element of originality of the commentator of ms. Oriel 33 (something which does not find a parallel in any of the commentaries discussed in this chapter and in the previous one, neither those preceding, nor those following it) is, however, the fact that, in the passage, he quotes both arguments together. What is more, he also seems to establish an inferential relation between them, insofar as the second one is taken to follow from the first one. The idea, that the commentator, however, does not expound any further, seems to be that the epistemological impossibility to know a given form (insofar as it is not able to perform its proper operation, the only way for us to get to know it) also forces us to claim that the form concerned does not exist in the entity under consideration. The astonishing move to make an ontological claim fully dependent on an epistemological one can probably be explained, in this case, by the peculiarity of the case at hand. Indeed, insofar as the proper operation of the accidental forms of sensible qualities is that of acting on the external senses, thus an operation which has a fundamental epistemological import, it might seem reasonable to claim that from an epistemological impossibility, in this case, follows an ontological one. This, however, also highlights once again the importance that the epistemological level of the debate on *minima sensibilia* still played in the Latin debate of the early 14th century.

Even apart from the use of the two arguments drawn from Averroes' *Long Commentary* on the *Metaphysics*, moreover, this argument seems to belong to the conceptual space of the Parisian debate on *minima sensibilia* insofar as, differently from the previous one employed by the author of the commentary of ms. Oriel 33, it does not merely argue that there cannot be in nature something which is sensible *virtute* that is not, at the same time, sensible *actione*. More boldly, it argues that something that is not sensible *actione* does not possess the *forma sensibilitatis*, that is, the essence proper to the accidental forms of sensible qualities. Not only, therefore, what is not perceptible in act does not possess the power to perform its proper operation of acting on the senses so as to engender a sensation, but, what is more, it does not even have the essence of a sensible quality. It is easy to see how this argument, although using a typical Oxford vocabulary, is based on concepts (and arguments) typical of the almost contemporary Parisian contemporary tradition.

This connection is reinforced by the fact that, after this argument, the commentator inserts a third one, also present in the commentary of ms. BnF Lat. 16160, namely, the one drawn from *Meteorologica* Book IV, according to which an entity that cannot perform its proper operation can be called by its name only equivocally.

Following it, the commentator gets to the arguments *quod sic*, and, interestingly (but in full agreement, in this case, with the commentary of ms. BnF Lat. 16160), he claims that the possibility of the existence on its own of a sensible quality that is not perceptible in act is something that Aristotle explicitly supports in the text of *De sensu* 6 (*Oppositum dicit Philosophus hic*[877]).

In his *determinatio*, the commentator follows a structure which is quite close to the one adopted in the commentary of ms. BnF Lat. 16160. Indeed, the commentator distinguishes between the case of parts of a sensible entity existing in that sensible whole which are too small to be perceived in act on their own, but that contribute to the overall perceptibility in act of the whole (the first meaning of potentially perceptible) and the case of parts existing on their own separately from the whole to which they belong. This latter case, however, presents a major difference with the commentary of ms. BnF Lat. 16160, and it is therefore worth quoting the relative passage in full:

> If, however, parts are considered as separate from the whole, so then many are sensible *virtute* which are not sensible *actione*, and the reason of this is <that> the sensible power is proportioned to [its] object, so that the more excellent the power, the smaller the modification [of the sense] it perceives, and, on the contrary, the smaller the modification, the more excellent sense requires and no other <sense is enough>; <but> the sense does not go on to infinity in the excellence of [its] power, such as the other natural powers do not; indeed it cannot be reached an infinitely acute sight, and the division of the sensible goes on to infinity once the external corrupting [agent] has been removed and assuming that such corrupting [agent] is sensible. This however is true, that the division of the sensible in parts which are not perceptible in act goes on further than the division of the sensible in parts which are perceived in act. Let us take, therefore, a minimal coloured [part of a sensible] (*minimum coloratum*) which can act on an extremely acute sight, but let us divide this coloured [part]. It is clear that no part of it [resulting from the division] will be seen, because it is not possible to posit a sense proportional to it. If, however, there were some sight which surpassed the first [minimal coloured part] in power as much as this part surpasses the whole in smallness, both parts [resulting from the division] would be seen, if such a sight supervened. Hence for what concerns it both parts [resulting from the division] are visible. The fact, however, that they are not seen is because of the deficiency of the sense and so no part [resulting from the division] is sensible *actione*, however both [of them] are sensible *virtute*, because both have the

[877] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 27, ms. Oxford, Oriel College, 33, f. 197rb.

> power to act on a sight proportional to themselves, if [such a sight] supervened, and similarly these parts united together, or when they become united in a whole, can act on sight, and so something which is not sensible *actione* can be sensible *virtute*[878].

The commentator explicitly admits that many entities can be sensible *virtute* (i.e., potentially perceptible in the third meaning, albeit always being "active", as I will show below) without being sensible *actione* (i.e., perceptible in act). At the same time, he remarks at the same time that this only happens *remoto corrumpente extrinseco*, therefore, as in the case of the commentary of ms. BnF Lat. 16160, pushing back the discussion to a hypothetical case with no bearing on the actual world, against what had been claimed by the commentators analysed in the previous section and, in a different way, also by Jandun.

Nevertheless, the use of the notion of a *minimum actione* introduces an important nuance that, as said, distinguishes the commentary from that of ms. BnF Lat. 16160. Indeed, the commentator is rather clear, in the last part of the passage quoted above, to claim that the sensible qualities of any portion of a given sensible whole existing on its own without being perceptible in act (thus, without being sensible *actione*) *are still "active"*, and they are not perceptible in act only due to the limitations of sensory powers, so that if a stronger sensory power existed, they would become perceptible in act. This understanding, which, as said, could be glossed, resorting to Aspall's terminology, by referring to the distinction between an *actio inclinans* and an *actio inclinans et consequens effectum*, seems to still echo, even if in a more refined theoretical framework, the notion of *minima secundum sensum* adopted by earlier Oxford commentators such as

[878] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 27, ms. Oxford, Oriel College, 33, f. 197rb: "Si vero partes considerentur ut separate sunt a toto, sic adhuc m<u>lte sunt sensibiles virtute qui non sunt sensibiles actione, et huius ratio est <quod> virtus sensitiva proportionatur obiecto, ita quod quanto virtus est excellentior, tanto minorem immutationem percipit, et e contra quanto immutatio est minor, tanto sensum excellentiorem requirit nec alius <sensus sufficit>; <sed> sensus non procedit in infinitum in excellentiam virtutis sicut nec alie virtutes naturales; nam non est accipere visum in infinitum acutum, et divisio sensibilis procedit in infinitum remoto corrumpente extrinseco et posito quod talis corrumpens sensibilis (*ms.* sensibile) <est>. Ist<u>d tamen verum est, quod divisio sensibilis in partes que actu non sunt sensibiles procedit ulterius quam divisio sensibilis in partes que actu sentiuntur (*ms.* sen<tiu>ntur ?). Accipiatur ergo minimum coloratum quod m<o>vere potest visum acutissimum, sed ist<u>d coloratum dividatur. Manifestum est quod neutra pars eius videbitur, quia non est dare sensum sibi proportionalem. Si tamen esset aliquis visus qui excelleret primum (sc. minimum) in virtute quantum ista pars excellit totum in parvitate, utrumque pars videbitur, si talis visus superveniat. Unde quantum est de se utrumque pars est visibilis, quantum autem non videatur, hoc est propter deficientiam sensus et ita neutra pars est sensibilis actione, utrumque tamen est sensibilis virtute, quia utrumque habet virtutem inmutandi visum sibi proportionalem, si superveniat, et similiter iste partes simul coniuncte, vel cum fiunt in toto coniuncte, possunt visum inmutare, et ita aliquod potest esse sensibile virtute quod non est sensibile actione."

Bacon, and still popular at the turn of the century, as the commentary of ms. Merton 276 clearly shows, but certainly completely foreign to the position of the commentary of ms. BnF Lat. 16160.

Interestingly, however, and differently from his predecessors, the author of the commentary of ms. Oriel 33 explicitly admits that, if there were no limitations to sensory powers, all the sensibles *virtute* existing on their own would be perceptible (and, indeed, perceived) in act. The reference to sensory powers stronger than the ones existing in nature, in this context, might bear a (very distant, admittedly) resemblance with Aquinas' and, more to the point, Jandun's use of the same concept.

Another important aspect of the passage to underline is the fact that, when discussing the conditions under which the sensible qualities of parts of a sensible whole existing on their own without being perceptible in act could become perceptible in act, it clearly distinguishes between two cases. On the one hand, such sensible qualities could become perceptible in act if they were united to a greater whole, but, on the other hand, they could become perceptible in act simply by uniting to a sufficiently great number of sensible parts existing on their own without being perceptible in act. This latter case makes even more explicit than in the other commentaries analysed in this section the increasing awareness, by early 14th-century Medieval Latin commentators, of the "corpuscularian" implications of the third meaning of potentially perceptible, although, as said, the commentator of ms. Oriel 33 keeps this discussion within the limits of a possible world without the corrupting action of the containing medium.

As an additional note, it must be remarked that, notwithstanding all the important differences from the Parisian commentary tradition represented effectively by the commentary of ms. BnF Lat. 16160, the influence exercised by this tradition on this commentator remains significant. This is reflected by the fact that, after presenting his *determinatio* in a way so closely reminiscent of the Oxford commentary tradition, he also states the same conclusion by having recourse to a conceptual couple already used in the context of the debate on *minima sensibilia* by both the commentator of ms. Vat. Lat. 2170 and by John of Jandun, i.e., the couple *actus primus-actus secundus*. The commentator, however, does not refer this conceptual couple to the distinction between the power of a sensible quality to act on the senses and its actualisation; rather (consistently with his idea that sensible qualities are always "active"), he refers it directly to the sense, by claiming

that it is possible to have a sensory power (the *actus primus*) and yet not being able to perceive in act the sensible qualities of extremely small portions of a sensible entity existing on their own (the *actus secundus*). The evident implication of the passage is that, contrary to the position typical of the Parisian tradition analysed in this section (and also in the previous one) the commentator firmly believes that the sensible qualities of extremely small portions of a sensible entity existing on their own always possess not only their *actus primus* (the power to act on the senses), but also their *actus secundus* (the performance of the action itself, although the action does not achieve its intended effect)[879].

This idea is also restated in very clear terms in the *responsio* to the first argument against the existence of qualities that are sensible *virtute* and that cannot become sensible *actione*, namely, the idea that since the power (to perform its proper operation) is the (last) perfection of an entity, and since an entity which could not perform its proper operation would not be perfect, then a sensible quality which has the power to act on the senses also always acts on the senses:

> To the first argument it must be said that 'power' can be understood in two ways. In one way as the last [completion] of the potency of a thing (*pro ultimo potentie rei*), such as if someone could do fifty, the power does not derive from the fact that he can do forty, but [only] from the fact that it can do fifty. In another way the power is understood, more properly (*magis consequenter*), as the quantity of potency (*pro tanto potentie*) that is the principle of action. Hence that which is sensible *virtute* in the former way is perfect and it can achieve its action (*potest in actionem*), but [this] is not necessary regarding the latter one. Or it can be said differently and better that to [the performance of] an action it is not only required an agent, but it is required a patient, hence whatever is sensible *virtute* is sensible *actione* if it finds its proper passive, but it is not so concerning sense and sensible[880].

[879] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 27, ms. Oxford, Oriel College, 33, f. 197rb: "Istud patet ex alio, quia virtus se habet ad actionem ut actus primus ad actum secundum, et actus primus potest esse sine secundo, ut <sicut> aliquis habet scientiam et non considerat, <sic habet> visum et non videt actu." Note that the example of the possession of science without its consideration is exactly the same used by Jandun in this context and also by the author of the commentary of ms. BnF Lat. 16160, although in the two latter commentaries it referred to sensible qualities themselves, and not to the sensory power required to perceive them.

[880] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 27, ms. Oxford, Oriel College, 33, f. 197rb: "Ad primam rationem dicendum est quod virtus accipitur dupliciter. Uno modo pro ultimo potentie rei, s<ic>ut si aliquis possit facere quinquaginta, virtus non accipitur ex hoc quod potest facere quadraginta [non est], sed ex hoc quod potest facere quinquaginta. Alio modo accipitur virtus magis consequenter pro tanto potentie qui est principium actionis. Unde id quod est sensibile virtute primo modo est perfectum et potest in actionem, sed de secundo non oportet. Vel aliter potest dici et melius quod ad actionem non requiritur solum agens, sed requiritur patiens, unde quodcumque est sensibile virtute sensibile est actione si proprium passivum obtineat, sed non est ita super de sensu et sensibili."

The passage is remarkable, in that the commentator presents in it a very effective illustration of the idea that a sensible quality is always "active" even when it is not perceptible in act. Indeed, the commentator, resorting to a numerical example[881], claims that there are two ways according to which something can be said to possess a given power (*virtus*), such as the power of exercising an action of an intensity of fifty units. Firstly, it can be said to possess such a power insofar as it can achieve in its action the intensity of fifty units, and only in this sense something possessing such a power can be said to possess it perfectly, and therefore to be able to exercise it in full. Secondly, however, and more modestly (but *magis consequenter*), something can be said to possess the same power insofar as it can act with a given intensity, which, although inferior to fifty, is certainly superior to zero. In this second case, the power is possessed only "imperfectly" by the entity considered, and therefore it cannot be fully actualised. Nevertheless, in both cases the power considered by the commentator is a power that is at least partially actualised. That is to say, going back to the case of sensible qualities, that the commentator is explicitly committed to the idea that whenever a sensible quality exists on its own, insofar as it possesses the power to act on the senses, it exercises an action towards them. Such action, however, in the case of sensible qualities united to portions of matter too small to be perceptible in act, is insufficient to produce a sensation.

This very same idea is restated in the second part of the passage, where the commentator brings into the discussion another element typical of the Parisian commentary tradition analysed in this section and in the previous one, namely, the issue of the correspondence between active and passive powers. Whereas Parisian commentators, indeed, focused on the conditions under which a given sensible quality could acquire its proper passive power, and therefore become able to act on the senses, the commentator of ms. Oriel 33 is fully convinced that sensible qualities are always "active", regardless of whether they can have a proportioned passive power, something which is only required for them to "complete" their proper operation, that is, to produce a sensation.

[881] Note that the use of an example with a quantified intensity of the action considered provides a strong reason in favour of the Oxford origin of the commentary, given the prominence of this conceptual tool at Oxford in the first half of the 14th century and its relative absence at Paris during the same period.

The fact that the two concepts of *virtus* and *actio* are not used by the commentator as synonyms of *potentia* and *actus* respectively, but rather in accordance with the meaning found, for instance, in the commentary of ms. Merton 276, is evident by the fact that, in the passage immediately following the one quoted above, which closes the *responsio* to the first argument *quod non*, the commentator notes that for Aristotle (differently from his use) *virtus* is a synonym of *potentia* and *actio* of *actus*:

> In a third way it could be said that Aristotle interprets power (*virtutem*) as potency (*pro potentia*), and action (*actionem*) as act (*pro actu*), and it is clear that [something] is either potency or act, and therefore [on this understanding] not every sensible *virtute* is sensible *actione*. Hence the first solution obtains if it applies to the part in a whole, [while] the second solution obtains regarding a part separate [from the whole to which it belongs][882].

Significantly, the passage states explicitly an aspect that I have already remarked: a fundamental difference between the use of *virtus* and *actio* in the way peculiar to the Oxford commentary tradition on *minima sensibilia* and the use of *potentia* and *actus* is that the former conceptual couple does not concern incompatible terms, while the latter does. That is to say, something that is sensible *actione* can also be said to be sensible *virtute* (even more than that, being sensible *virtute* is a necessary condition in order for something to be sensible *actione*), although, of course, something that is sensible *virtute* can at the same time not be sensible *actione*. On the contrary, something that is perceptible in act cannot be said at the same time to be potentially perceptible, and viceversa.

The same insistence on the fact that sensible qualities always remain "active", finally, is evident in the way in which the commentator replies to the second argument *quod non*, i.e., the combination of the two arguments drawn from Averroes' *Long Commentary* on the *Metaphysics*:

> To the second argument it must be said that he who takes away the operation takes away the form, and this for things existing in this disposition in which they were born to act; but a thing was not born to act if not on a passive, and therefore if it will

[882] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 27, ms. Oxford, Oriel College, 33, f. 197rb: "Tertio modo potest dici quod Philosophus virtutem accipit pro potentia et actionem pro actu, et manifestum est quod aut potentia est aut actus, et ideo non omne sensibile virtute est sensibile actione. Unde prima solutio habetur si fiat de parte in toto, secunda solutio habetur de parte separata."

not have [its proper] action for the defect of the passive there is no need to take away the form[883].

Instead of focusing on the conditions under which a sensible quality can be said to possess its proper operation even when it is not able to perform it, as the commentator of ms. BnF Lat. 16160, following Jandun, does (but also as the commentators analysed in the previous section had already suggested), the commentator of ms. Oriel 33 chooses to focus instead on the conditions under which a sensible quality can be said to possess its proper operation even when it does not find a passive power corresponding to it. That is to say, the proper operation of a sensible quality is not qualified, as it generally was in the Parisian commentary tradition explored in this section and in the previous one, by reference to the fact that it requires that the sensible quality itself be present *sub debita quantitate* (therefore a condition applying to the sensible itself). Rather, the condition mentioned by the commentator of ms. Oriel 33 only concerns the presence of a proportioned passive power, therefore it is a condition applying to the sense, rather than to the sensible (thus echoing, once again, a fundamental tenet of the doctrine of *minima secundum sensum*). This is an important theoretical difference, which testifies, once again, to the fact that, contrary to the contemporary Parisian commentary tradition, the commentator of ms. Oriel 33, following into the footsteps of the previous Oxford commentary tradition, firmly believes in the idea that sensible qualities are *always* "active", regardless of the quantity of matter in which they are present.

4.3.4. Jandun's Contemporaries on *Minima sensibilia*: A Summary

The two *De sensu* commentaries of ms. BnF Lat. 16160 and of ms. Oriel 33 testify, although in different ways, to the presence of a wider context in which Jandun's doctrine of *minima sensibilia* developed.

In the case of the commentary of ms. BnF Lat. 16160, this is certainly an immediate context, since the commentary, by all evidence, originated from the Parisian Faculty of Arts exactly around the same years around which Jandun composed his

[883] ANONYMUS, *Quaestiones super De sensu et sensato*, q. 27, ms. Oxford, Oriel College, 33, f. 197rb: "Ad secundam rationem dicendum est quod qui aufert operationem ipse aufert formam, et hoc rebus existentibus in ista dispositione qua nate sunt agere; sed res non est nata agere nisi in passivum, et ideo si non habeat actionem propter defectum passivi non oportet auferre formam."

commentary (to the point of suggesting that the discussion of *minima sensibilia* in the two commentaries can be interpreted as the evidence of a specific *complexe question-réponse*, to use a concept devides by Alain de Libera).

The proximity of the commentary of ms. BnF lat. 16160 with Jandun's commentary can be identified first of all in the fact that it discusses the conceptual possibility of the existence of sensible qualities that are not perceptible in act in a separate *quaestio* (largely analogous to q. 29 of Jandun's commentary), and that, in developing the discussion in such *quaestio*, he makes use of the argument taken from Averroes' *Long Commentary* on *Metaphysics* Θ according to which if entities did not possess the power to perform their proper operation, they would not possess their distinct essences.

Still, when it comes to the *determinatio* of the *quaestio*, it becomes rather clear that the commentary does not present anything even close to the refined theoretical elaborations of Jandun's commentary. His basic solution is based on the idea (shared by the three commentaries analysed in the previous section) that a necessary condition for the existence of a given formal entity is merely that it possess the power to perform its proper operation when existing in a sufficient quantity of matter (these he identifies as 'perfect entities'). Moreover, the commentator also appears to claim, differently from Jandun, that the overall discussion does not concern the actual world, but rather merely a possible world without the corrupting action of the containing medium.

The commentator also discusses the issue of the correspondence between active and passive powers in connection with the problem of the existence of sensible qualities that are not perceptible in act. Interestingly, while he also present the solution adopted by the authors of the commentaries of ms. Vat. Lat. 2170 and of ms. Vat. Lat. 3061, according to which such a correspondence is necessary only when the entities which sould possess both powers are present in a sufficient quantity of matter, he also remarks, opening the way to a more "corpuscularian" train of thought, that the correspondence between active and passive powers is maintained whenever the entity which should possess an active power (in this case, a sensible quality that is not perceptible in act on its own) is capable to act on its corresponding passive power either on its own or as part of a greater whole (i.e., as part of a sensible qualitity that is perceptible in act).

All in all, therefore, the commentary of ms. BnF, Lat. 16160, on the one hand, appears to be a witness, together with Jandun's one, of a *complexe question-réponse* that

was orienting the debate on *minima sensibilia* at the Parisian Faculty of Arts around 1310. On the other hand, however, it also shows that Jandun's claims were not entirely shared by the other *magistri artium* participating in the debate, and that more cautious and more "traditional" views could still prevail with respect to some of the most important (and most radical) ones among them.

The commentary of ms. Oriel 33, probably composed by an Oxford master active around 1310-1330, attests to the fact that the Parisian debate represented both by Jandun and by the author of the commentary of ms. BnF Lat. 16160 enjoyed a wider circulation. The author of the commentary of ms. Oriel 33, indeed, just as Jandun and the author of the commentary of ms. BnF lat. 16160, discusses the issue of the existence of "imperceptible" sensible qualities in a separate *quaestio*. Moreover, also in his case the argument from Averroes' *Long Commentary* on *Metaphysics* Θ features prominently, and, moreover, this argument is also supplemented by the corresponding one from Averroes' *Long Commentary* on *Metaphysics* H which had already been used by Peter of Auvergne in his own discussion of *minima sensibilia*.

Nevertheless, not only the author of the commentary takes the discussion to concern merely a possible world without the corrupting action of the containing medium (differently from Jandun, but in analogy with the author of the commentary of ms. BnF Lat. 16160), but, what is more, he also bases his analysis on the use of the conceptual couple of sensible *virtute* and sensible *actione*, employed in a way closely reminiscent, for instance, of that of the author of the commentary of ms. Merton 276. In this sense, what the commentator is truly discussing is not, as in Jandun and in the author of the commentary of ms. BnF Lat. 16160, the existence of sensible qualities that do not possess the power to perform their proper operation, i.e., that of acting on the external senses so as to engender a sensation, but only the existence of sensible qualities whose action towards the senses, due to the smallness of the matter with which they are united, is not sufficient to engender a sensation in them. In this sense, the commentator fundamentally shares the idea, typical of the Oxford debate on *minima sensibilia*, that sensible qualities are always "active" towards the senses, no matter how small is the matter with which they are united. The only limitation to their ability to perform their proper operation (what makes them "imperceptible" in act) is the limitation of the sensory powers that should perceive them. In this sense, the author of the commentary of ms. Oriel 33, while clearly

influenced by the Parisian debate that I have analysed in this section and also in the previous one, fundamentally shares the doctrine of *minima secundum sensum* dating back at least to Roger Bacon and which also played a fundamental role in the commentary of ms. Merton 276.

This position, however, is explicitly used by the commentator in a confrontation with the contemporary Parisian debate from which he is influenced. Two elements emerge from this direct confrontation.

First of all, the commentator notes that the 'power' of a formal entity to perform a proper operation can be understood in two ways, either as the power needed to achieve an action (the power to perform an *actio inclinans et consequens effectum*, to use Aspall's terminology), or as the power sufficient to perform that action, regardless of whether its intensity is sufficient to achieve it (the power to perform a mere *actio inclinans*, to use, again, Aspall's terminology). While a sensible quality always possesses the latter, it does not necessarily always possess the former.

Moreover, the doctrine of *minima secundum sensum* also provides the commentator with a reply to both of Averroes' arguments: indeed, insofar as the limitation of sensible qualities to the performance of thier proper operation does not depend on the sensible qualities themselves, but rather only on the sensory powers, the arguments do not apply to "imperceptible" sensible qualities interpreted as sensibles *virtute*.

All in all, it might be claimed that the commentary of ms. Oriel 33 testifies, once again, to the fact that even in the early 14th-century debate on *minima sensibilia* (and even when it came in close contact with the Parisian commentary tradition) the distinctiveness of the Oxford commentary tradition remained that of conceiving sensible qualities as always “active”, and of intepreting all limitations to their perceptibility in act to be fully dependent on the external senses themselves and on their sensory powers, contrary to what was typical of the Parisian commentary tradition.

4.4. The “Mature” 14th-Century Debate on *Minima sensibilia*: Walter Burley, John Buridan and the Commentary Attributed to Nicole Oresme and Albert of Saxony

With Walter Burley’s commentaries on the *De sensu*, one moves towards a different phase of the Medieval Latin debate on *minima sensibilia*. Indeed, starting with

Burley's commentaries, the acceptance of the existence on their own, in the actual world, of sensible qualities that are not perceptible in act becomes commonplace. The reasons for this fundamental theoretical change are two.

The first reason is that, as I have shown in the second chapter of the present thesis, starting with Burley, and then moving on to Oresme, Buridan and Albert of Saxony (although all these authors adopt a completely different theoretical model than Burley's one, as shown in Chapter 2), at least in Paris it becomes frequent to conceive substantial change as a process taking place through an extended interval of time. This conception, of course, does not concern only the process of corruption of substantial forms, but also, inevitably, that of the accidental forms of their sensible qualities (an aspect that, once again, highlights the level of interconnectedness between the debate on *minima naturalia* and that on *minima sensibilia*).

In a sense, the impact of this theoretical change on the debate on *minima sensibilia* is, if possible, even more direct than the one on the debate on *minima naturalia*. Indeed, after all, the passage in which Aristotle discusses the corruption of extremely small portions of a material substance by the containing medium does not belong to *Physics* I.4 but to *De sensu* 6 (and, of course, although to a minor extent, to *De generatione* I.10). Moreover, as I have shown throughout the previous chapter and the present one, the denial of the possibility of the existence, in the actual world, of sensible qualities associated with portions of matter existing on their own that are too small to be perceptible in act is based, in Aristotle's text, exactly on the claim that such portions of matter (and therefore the accidental forms of their sensible qualities) would be immediately corrupted by the containing medium. To stick to the terminology adopted in this and in the preceding chapter, the Aristotelian principle of the coextension of the sensible world and of the perceptible one is "protected" by a conception of substantial change according to which the containing medium corrupts *immediately* portions of matter too small to be perceptible on their own.

Once the instantaneous nature of this process of corruption is denied, the principle loses its support and, as a consequence, the discussion concerning the existence of sensible qualities united to portions of matter existing on their own that are too small to be perceptible in act moves from a mere hypothesis related to a possible world to a description of the actual world. In this sense, while, in the case of *minima naturalia*, I

have argued that the new conception of substantial change made any positively characterised notion of *minimum naturale* progressively vanish, in the case of *minima sensibilia* this new conception reinforced and made much more relevant the notion of sensible qualities united to portions of matter existing on their own that are too small to be perceptible in act, whose actual existence could not be denied anymore.

Therefore, the belief in the existence on their own of sensible qualities which are not perceptible in act in the actual world and the corresponding belief in the fact that, contrary to the Aristotelian principle of the coextension of the sensible world and of the perceptible one, there is a part of the sensible world that escapes detection by the senses, lie, in part, at the foundation of the main conceptual developments that are witnessed in the debate on *minima sensibilia* of the period ca. 1320-ca. 1350, that is, the last period taken into consideration in the present thesis.

True, as I have remarked above, it might be the case that temporally extended conceptions of substantial change started to circulate well before the period ca. 1320-ca. 1350, since, as I have briefly remarked above, some traces of such a conception seem to be already present in Brito's *De sensu* commentary (dating between ca. 1290 and ca. 1305), in the *De sensu* commentary of ms. Vat. Lat. 3061 and maybe, although with less textual support, in the *De sensu* commentary of ms. Vat. Lat. 2170 (both likely dating around the turn of the century). Still, it is quite evident from the discussion of these commentaries as presented above that these traces were far from representing a full-fledged and all-encompassing theoretical conception (in Brito, indeed, the new temporally extended conception of substantial change is even presented as a mere hypothesis alongside Aristotle's own "traditional" conception of substantial change). The hints to the temporally extended conceptions of substantial change present in these commentaries, therefore, while affording their authors to discuss the case of sensible qualities existing on their own without being perceptible in act as applying to the actual world (and also probably influencing John of Jandun in this respect), did not allow them to make the debate on *minima sensibilia* fully independent from the issue of the corruption of the sensible qualities of extremely small portions of matter by the containing medium, and, therefore, to fully develop the new ontology and the new epistemology of the sensible world mentioned above. It is exactly this independence (together with the innovative ontology and epistemology of the sensible world deriving from it) the main

novelty that can be found in *De sensu* commentaries dating between the period ca. 1320-ca. 1350 (although it must be remarked that, in this respect, they had at least a forerunner in the 13th century, namely, Albert the Great).

More specifically, this independence starts to be witnessed in Burley's *De sensu* commentaries, as said, and it will become even more apparent in John Buridan's *De sensu* commentaries, and also in the *De sensu* commentary attributed both to Nicole Oresme and to Albert of Saxony. Nevertheless, in such commentaries the new ontology and the new epistemology of the sensible world based on the acceptance of the existence on their own, in the actual world, of sensible qualities that are not perceptible in act, is not predominantly linked to the new conception of substantial change. Certainly such conception features explicitly in Burley's *Quaestiones* on the *De sensu* (while its presence already in the *Commentarium* remains difficult to be ascertained) and in most versions of Buridan's commentaries on the *De sensu* (even if it is based on a completely different conceptual model than Burley's one, as already seen in Chapter 2 and as remarked above), but it is rejected in the commentary attributed to Oresme and to Albert of Saxony, where one witnesses a revival of the "instantaneous" understanding of the corruptiong of extremely small portions of matter (and of their sensible qualities) by the containing medium, pointing, be it said incidentally, to the fact that temporally extended conceptions of substantial change met with resistence during the second half of the 14th century, even at Paris.

The aspect, instead, that seems to ground the new ontology and epistemology of sensible qualities based on the existence on their own, in the actual world, of sensible qualities that are not perceptible in act, both (partially) in Burley (at least in the *Quaestiones*) and Buridan and (exclusively) in the commentary attributed to Oresme and Albert of Saxony, is the acceptance of the idea, dating back especially to Jandun's *De sensu* commentary (but, in Burley's case, possibly contributing to influence it), that, regardless of the way in which substantial change unfolds, the existence on their own, in the actual world, of sensible qualities that are not perceptible in act is granted by the fact that the threshold of corruptibility of such sensible qualities and of the portions of matter to which they are united, contrary to Aristotle's original view, is lower than the threshold of their perceptibility.

This second theoretical change characterising the period ca. 1320-ca. 1350 destroyed the other Aristotelian foundation of the principle of the coextension of the sensible world and of the perceptible one alongside the instantaneous view of substantial change (namely, as just mentioned, the idea that the threshold of perceptibility of sensible qualities is equal or inferior to that of their corruptibility). Moreover, it also provided a more "solid" foundation to the idea that sensible qualities can exist on their own, in the actual world, without being perceptible in act. Indeed, after all, the temporally extended conception of substantial change only allows to admit the existence *for a certain (short) span of time*, that is, during the process of corruption, of sensible qualities that are not perceptible in act (what I thus refer to as "ephemeral" sensible qualities that are not perceptible in act). On the contrary, the idea that the threshold of corruptibility of sensible qualities is inferior to that of their perceptibility allows to admit the existence of "permanent" sensible qualities that are not perceptible in act. These "permanent" qualities, moreover, as it has already appeared in Jandun's case, and as it will become clear also in the case of Burley, Buridan and of the commentary attributed to Oresme and to Albert of Saxony, represent also better candidates, when compared with their "ephemeral" counterparts, to ground a "corpuscularian" model of perception based on the idea that they can become perceptible in act by joining together so as to form greater entities.

It is no surprise, therefore, that in the long run, it would have been this latter aspect, far more than the former one, to provide the foundation for conceiving a natural world which extends far beyond the reach of our senses.

To see, however, how the commentators mentioned articulated their views, I turn to their texts without further ado.

4.4.1. Walter Burley's Doctrine of *Minima sensibilia*

4.4.1.1. Walter Burley on *Minima sensibilia*: Varieties of "imperceptible" Sensible Qualities

It is well known that Walter Burley wrote a literal commentary on the *De sensu*, which is preserved in five manuscript witnesses[884]. The commentary, divided in a prologue and ten chapters and, as mentioned, probably to be dated to the period in which Burley was regent master at Merton College in Oxford (ca. 1300-1307)[885], is not a purely literal commentary. Indeed, much like Felmingham (?), although to a more reduced extent, Burley often raises true *quaestiones* on the text of the *De sensu*, and in some cases, such as that of *De sensu* 6, 445b3-446a20, concerning *minima sensibilia*, the only commentary of the corresponding section of the Aristotelian text is in the form of one or more *quaestiones*. The probable early dating of Burley's *Commentarium in De sensu et sensato Aristotelis* might make one question why, after all, the text is discussed after Brito's commentary on the *De sensu* and after the two commentaries of ms. Vat. Lat. 2170 and of ms. Vat. Lat. 3061 strictly connected with his, and even after Jandun's commentary (explicitly dated to 1309) and the commentaries of ms. BnF Lat. 16160 and of ms. Oriel 33, which, as I have argued, are closely related to it (also chronologically). Apart from the fact that, as I will show below and as I have already partially anticipated, the text already hints towards a conception of *minima sensibilia* which is much closer to the one which became predominant, at least at the Parisian Faculty of Arts, since the 1320s onwards, there is no reason to think that Burley ceased to comment upon the *De sensu* after the early days of his regency at Merton College.

Indeed, recently scholars have pointed to the existence of a manuscript witness of a question commentary by Burley himself. In particular, Juhana Toivanen, in his recent

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[884] They are the following ones (for more details, cf. the Appendix to the thesis):
- Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2151 (14th century), ff. 244r-256r.
- London, British Museum, Lambeth Palace 74 (AD 1390), ff. 175r-184v.
- Oxford, Magdalen College, Lat. 146 (14th-15th century), ff. 95r-104v.
- Oxford, Oriel College, 12 (15th century; kept in the Bodleian Library), ff. 86v-99.
- Pamplona, Biblioteca de la Catedral, 24, ff. 175v-192v (incomplete at beginning).

Note that in what follows I always quote the *Commentarium* according to the draft version of the critical edition in preparation at the University of Łódź by Professor Marek Gensler and Dr. Monika Mansfeld, whom I wholeheartedly thank for having granted me access to the text.

[885] Cf. VITTORINI, *Life and Works*, *op. cit.*, p. 46.

editions of Medieval Latin commentaries on *De sensu* 7[886], has demonstrated that the ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Ottob. Lat. 2165, ff. 48v-63v, traditionally considered one of the witnesses of Burley's *Commentarium*, contains not the text of Burley's *Commentarium*, but rather a a set of *quaestiones* on the *De sensu* possibly attributable to Burley[887]. Although the dating of these *Quaestiones* (even merely with reference to the *Commentarium*) remains impossible to be determined, at the present state of research, their existence, if they really are by Burley, leaves at least open the possibility that Burley kept commenting upon the *De sensu* even after the *Commentarium*, in analogy with what happened, for instance, in the case of the *Physics*. This consideration, combined with the fact that both commentaries present a more "mature" view concerning *minima sensibilia* than the commentaries analysed in the previous two sections (although this view is less clearly discernible in the *Commentarium*), and rather close to that of the commentators that will be at the centre of this section (John Buridan and the author of the anonymous commentary attributed to Nicole Oresme and to Albert of Saxony) provides a sufficient justification, I believe, to discuss Burley's commentaries here (and to discuss them together) rather than in any of the previous sections of this chapter or of the previous one.

Given that the *Commentarium* and the *Quaestiones* present a discussion of *minima sensibilia* that is structured in a rather analogous way, whenever possible I will discuss in conjunction in what follows (also given the fact that, as said, no precise chronological relation between them can be established). Nevertheless, I will look at the details of the account presented in each commentary separately. As I will show, this will only help enlighten and reinforce the conclusions reached in the analysis of each of them.

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[886] Cf. TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 124-131. Toivanen (*ibid.*, pp. 194-198) has also edited the last *quaestio* of the commentary preserved in this manuscript (q. 26, *Utrum contingat aliquem sentire simul diversa sensibilia*).

[887] It is true that, as I have mentioned in the previous chapter, the situation is made even more complex by the recent discovery I made together with Juhana Toivanen concerning the fact that the ms. London, BM, Add. 18630 attributes the *Quaestiones* on the *De sensu* it contains, and that present the same text as those of ms. Merton 276, to Burley. Still, as I said in the previous chapter, the attribution of this latter commentary to Burley could be only properly evaluated only after a proper palaeographic and codicological examination of the text contained in the London manuscript. In the meantime, I have deemed preferable to discuss the text as an anonymous *De sensu* commentary dating either to the end of the 13th century or to the very beginning of the 14th one, also considering the fact that the doctrine of *minima sensibilia* it presents is mostly in line with the 13th-century Oxford discussion on *minima sensibilia* and, at the same time, it does not show any of the distinctive elements of Burley's discussion in the *Commentarium* and in the *Quaestiones* of ms. Vat. Ottob. 2165.

In both commentaries Burley starts his *determinatio* by considering the Aristotelian distinction between a division *per se* in equal and unequal parts of a continuous entity on the one side, and a division *per accidens* in equal and unequal parts of a sensible quality existing in a continuos entity. In both commentaries, much like the author of the commentary of ms. Oriel 33, Burley takes all the divisions considered by Aristotle to be real separations of parts, and he therefore does not consider the (potentially infinite) division of a continuous entity (and therefore of its sensible qualities) in unequal parts to be a mere imaginative process. Nevertheless, partially differing from the author of the commentary of ms. Oriel 33, and getting closer to the Parisian commentary tradition represented especially by the author of the commentary of ms. BnF Lat. 16160 (but also by Jandun, in this respect), in the *Commentarium* he claims that, while the division of a continuous entity in equal parts cannot go on to infinity (and so neither can the division *per accidens* of sensible qualities according to such division), the case of the division of a continuous entity in unequal parts allows for a (potentially) infinite process, and, as such, necessarily entails that sensible qualities are (potentially) infinitely divisible according to such process of division.

In the case of the author of the commentary of ms. BnF Lat. 16160 (as in Jandun's case), however, as seen, this claim would have been subordinated to the proviso that the real separation of sensible qualities according to the real separation of the portions of matter to which they are united can be a (potentially) infinite process if and only if one imagines to take away the corrupting action of the contanining medium. In Burley's commentaries, however (certainly in the *Quaestiones*, but possibly already in the *Commentarium*[888]), since the corrupting action of the medium does not prevent the

[888] Given the probable early dating of the *Commentarium*, it might be objected that there seems to be no reason to hypothesise that Burley was already relying, in such a young work, on the temporally extended conception of substantial change founded upon the idea that corruption is the inclusive limit of alteration, an idea that, as discussed in the second chapter of the thesis, seems to have first been advanced in the early 1320s in the *Tractatus primus* and then featuring (at least) in Burley's last *Physics* commentary. More than this, as I have remarked, no trace of such a conception seems to be present in Burley's early *De generatione* commentary, dating, with good probability, to the same years to which the *Commentarium* on the *De sensu* should belong. Is it not, therefore, a mere *petitio principii* to claim that Burley relies in the *Commentarium* on a peculiar conception of substantial change of which there seems to be no trace in his other early works and that, what is more, is rather taken as a premiss in the *Commentarium*'s discussion of *minima sensibilia*, and not even clearly articulated? This is, I believe, a strong objection, yet not one that cannot find an adequate reply. Such a reply is based on two considerations. The first one is that it is very hard to claim, at the present state of research, whether or not Burley's peculiar view of substantial change is present in his early works, and, more in general, in all works predating the *Tractatus primus*. Not only many of Burley's early works, most notably many of the Aristotelian commentaries dated to the period ca. 1300-1307, remain

(potential) infinite divisibility *per accidens* of sensible qualities in the actual world (once substantial change is understood as a process taking place through an extended interval of time), this proviso is not necessary anymore, and the process of the real separation in unequal parts of sensible qualities according to the real separation in unequal parts of the portions of matter to which they are united automatically becomes, in the actual world, a (potentially) infinite process. That is to say, in Burley's view, whenever sensible qualities are really separated from the whole to which they belong according to a (progressive) division in unequal parts of the matter to which they are united, their process of separation is necessarily (potentially) infinite[889].

unedited and barely studied, but even in works that have already received important studies in secondary literature such a view has passed unnoticed. Although I do not have any example of this aspect for works predating the *Tractatus primus*, I believe that the example of Burley's last *Physics* commentary should be more than enough in this respect. Indeed, as I mentioned in the second chapter of this thesis, while such a commentary has already been studied in detail, nobody, in the published literature, had ever noticed that, at least in his discussion of *minima naturalia* in the commentary on *Physics* I.4, Burley heavily relies on his peculiar conception of substantial change that views corruption as the inclusive limit of alteration. How, then, is it possible, at the present state of research, to claim with a sufficient degree of confidence that such a view is absent even from the edited (and studied) works by Burley dated before the *Tractatus primus*? The second consideration is that, once it is conceded that Burley, in the *Commentarium*, accepts the existence in the actual world of sensible qualities that are not perceptible in act (something that seems hard to deny, on the basis of the texts quoted above), and this on the basis of the conception of substantial change as a temporally extended process, it would certainly be theoretically more parsimonious (and historically more plausible) to think that he had already adopted the conception of substantial change which he certainly adopted later rather than hypothesising that he was relying on a different conceptual model of substantial change (as a temporally extended process) of which we have no positive evidence whatsoever in the extant texts and that, in any case, he should have later repudiated in favour of his view of corruption as the inclusive limit of alteration. On the basis of these two considerations, therefore, I think that I have sufficient ground to affirm that already in the early *Commentarium* Burley seems to rely, in his discussion of *minima sensibilia*, on the conception of substantial change he will later certainly adopt, and also that, *a fortiori*, he adopts it in the *Quaestiones*, which I take to be a later work than the *Commentarium* and one composed when Burley was already in Paris (albeit reasonably before the composition of the *Tractatus primus*). In this respect, it should also be noted that the fact that such a conception is taken as a premiss of the discussion of the issue of *minima sensibilia* becomes more evident in the *Quaestiones*, as I will now show.

[889] GUALTERUS BURLAEUS, *Commentarium in De sensu et sensato Aristotelis*, cap. 6, ed. MANSFELD, forthcoming: "Loquendo de divisione quantitativa sic potest sensibile dividi: vel in partes aequales vel in partes inaequales; unde duplex est divisio quantitativa: quaedam in partes eiusdem quantitatis et quaedam in partes eiusdem proportionis. Loquendo de divisione quantitativa quae est in partes aequales sic sensibile nec aliquod continuum dividitur in infinitum, quia quodlibet continuum quantumcumque magnum potest consumi per ablationem partium finitarum aequalium ab eo. Unde non est aliquod quantum ita magnum, quin ipsum possit consumi per ablationem alicuius quanti quantumcumque parvi et iterum tanti, et cetera. Unde, si a caelo auferetur tantum quantum est millesima pars grani milii et iterum tantum et iterum tantum, per talem ablationem consumeretur totum caelum. Et ideo dicit Philosophus quod sensibile non dividitur in infinitum in partes aequales. Alia est divisio quantitativa in partes inaequales, ut videlicet in partes eiusdem proportionis; verbi gratia: auferatur aliquid a continuo et postea dimidium tanti et tertio dimidium tanti quantum fuit secundo ablatum, et sic continue loquendo de tali divisione; sic continuum est divisibile in infinitum. Si enim aliquid auferatur a continuo et postea dimidium tanti et iterum dimidium tanti, isto modo numquam consumetur continuum, sed semper restabit aliquid dividendum. Isto modo loquendo dico quod qualitas sensibilis est divisibilis in infinitum, sicut et ipsum continuum est divisibile in infinitum."

The acceptance of a temporally extended conception of substantial change, as said, would already naturally lead Burley to the acceptance of the belief in the existence on their own, in the actual world, of "ephemeral" sensible qualities that are not perceptible in act (and, thus, to the denial of the Aristotelian principle of the coextension of the sensible world and of the perceptible one). Nevertheless, in both commentaries the aspect that seems to ground Burley's belief in the existence on their own, in the actual world, of sensible qualities that are not perceptible in act, is rather the idea that the threshold of perceptibility of sensible qualities is superior to that of their corruptibility (although this distinction is never formalised by the use of a conceptual couple such as that of *insensibile-insensibile omnibus modis* adopted by Jandun).

Indeed, both in the *Commentarium* and in the *Quaestiones* Burley discusses the case of "imperceptible" sensible qualities existing in act on their own in the actual world by having recourse to an example that unmistakably forces one to think that Burley takes them to be "permanent" entities, and not merely "ephemeral" ones.

In the *Commentarium*, Burley introduces the example in the following passage, in the context of a more general presentation of the issue of the existence on their own of sensible qualities that are not perceptible in act:

> To this Aristotle says that some are the parts that can remain separately after the division and some [are the parts that] cannot or, if they remained, they would not act on the sense, indeed the action of the whole does not always belong to any [of its] parts (*actio totius non semper competit cuilibet parti*), indeed a recipient full of millet seeds falling to the ground causes a sound, but a single seed does not. Hence there is a certain part of a sensible quality or of a sensible body that, if it were separated from the whole, would not move the sense[890].

The passage is extremely interesting, insofar as it discusses the existence on their own of sensible qualities that are not perceptible in act using a lexicon (and an argumentative strategy) typical of the Oxford commentary tradition, although being ready to turn it on its feet when necessary to his own argument. Indeed, Burley uses the typical Oxford label of *actio* to refer to the ability of sensible qualities to act on the senses (contrary to the

[890] GUALTERUS BURLAEUS, *Commentarium in De sensu et sensato Aristotelis*, cap. 6, ed. MANSFELD, forthcoming: "Adhuc dicit Philosophus quod quaedam sunt partes quae possunt manere separatim post divisionem et quaedam non vel, si manerent, non moverent sensum, nam actio totius non semper competit cuilibet parti, nam modulum plenum granis milii cadens in terram causat sonum sed unum granum non. Unde est aliqua pars qualitatis sensibilis vel corporis sensibilis quae, si esset separata a toto, non moveret sensum."

more standard Parisian label of *operatio*) and he clearly affirms, using *à rebours* a traditional Oxford argument already mentioned multiple times throughout the thesis in connection to the debate on *minima*, that it is not always the case that, in a given homogeneous whole, only because something is true of the whole it is also necessarily true of any of its proper parts. In this case, more specifically, Burley claims that the ability to act on the senses so as to engender a sensation is something that can unproblematically belong to a sensible whole without belonging to all of its parts once separated from it.

The example used by Burley in the passage (which is taken from *Physics* VII.5, 250a20-25, as recalled in the previous chapter), had already been used by Peter of Auvergne, as seen in the previous chapter (and Burley will also use it in the *Quaestiones*, as I will show below). Such an example concerns the difference between the resulf of the fall to the ground of a recipient full of millet seeds (taken as a whole; although this is not a material substance) and of a single millet seed (taken as a part of that "improper" whole). While the recipient, or, better, the heap of millet seeds produces a sound by falling to the ground, a single millet seed does not. This example is crucial in understanding Burley's position concerning sensible qualities existing on their own that are not perceptible in act. Indeed, by claiming that a single millet seed falling to the ground does not cause a sound, Burley explicitly admits that a material substance (or, better, a portion thereof), i.e., a *permanent* entity, can exist on its own without being perceptible in act. More than that, the example claims that such a material substance (or portion thereof) exists on its own without being perceptible in act *in the actual world*. The example, therefore, and, more precisely, Burley's belief in the existence on their own in the actual world of sensible qualities that are not perceptible in act seems to be based on the idea that, according to Burley, the threshold of perceptibility of material substances is superior to that of their corruptibility, and, therefore, on the denial of the principle of the coextension of the sensible world and of the perceptible one.

One obvious objection to this reconstruction would be to remark, as already briefly noticed in connection with Peter of Auvergne's use of the same example, that it is not clear whether it targets the case of a sensible quality that is not perceptible in act or a case where, more simply, there is no sensible quality at all. Indeed, as already remarked, the ontological characterisation of sound as a sensible quality is a particularly delicate and elusive affair in Scholastic Aristotelianism. Sound, differently from the other sensible

qualities, was frequently taken by Medieval Latin Aristotelian commentators as existing primarily in the medium, in association with the vibration of air with which it is transmitted to the sense organ, and not in the sensible object itself[891]. If this is so, therefore, what the example seems to show is simply that a single millet seed falling to the ground does not case any vibration of the air whatsoever, so that no auditory sensible quality is generated by it. Still, it is rather clear from the context in which the example is introduced that this is not Burley's way of using it. Burley, in other words, is explicitly discussing whether something which has the nature of a sensible object can exist on its own without being perceptible in act. The fact that the example only targets the sense of hearing and its proper sensible is irrelevant. Once the appropriate conclusion is drawn from it, one cannot avoid extending it to all the other sensible qualities, unless one wants to introduce an unwarranted asymmetry among the proper sensibles. Moreover, I will point to two different but equivalent examples concerning colours in the analysis of Buridan's discussion of *minima sensibilia*.

This said, this reconstruction has to face a further problem, namely the fact that, from the way in which the passage is framed, it woud seem that Burley takes this example to be valid merely in a possible world without the corrupting action of the containing medium (thus interpreting it in analogy with the way in which Peter of Auvergne had already interpreted it). This is suggested by the two conditional clauses used both in the opening and in the closing sentence of the passage itself. Unfortunately, in the absence of a more extended discussion, it is impossible to determine Burley's position beyond reasonable doubt. This is particularly unfortunate, given that, if one were to assume that Burley, in the *Commentarium* (considering it a work to be dated betwenn ca. 1300 and ca. 1307), had already adopted the view that the threshold of perceptibility of sensible qualities is superior to that of their corruptibility, it might also reasonably be conjectured that Burley's arrival in Paris, in or around 1307, influenced Jandun (and the author of the commentary of ms. BnF Lat. 16160) in this respect.

Be that as it may, what can be claimed beyond doubt is simply that, as I will show below, Burley presents the same example without framing it with conditional clauses in the *Quaestiones*, so that, at least when he composed this work (for which, however, no precise chronology can be determined at the present state of research, as said), he had

[891] On this aspect, see especially PASNAU, "Sensible Qualities. The Case of Sound", *op. cit.*

adopted the view that the threshold of perceptibility of sensible qualities is superior to that of their corruptibility, and he had consequently accepted the existence on their own, in the actual world, of "permanent" sensible qualities that are not perceptible in act.

Regardless of whether, in the text of the *Commentarium*, Burley affirms that "permanent" sensible qualities can exist on their own without being perceptible in act in the actual world, or whether he limits this claim to a possible world without the corrupting action of the containing medium, he does however draw an important consequence from this conclusion for what concerns the definition of what is 'sensible':

> And that part [i.e., a part of the sensible that is not perceptible in act on its own] is called 'sensible' not because it moves the sense by itself, but because it moves the sense with other [parts]. Hence something is said to be sensible in two ways: or because it can be perceived separated from the whole [to which it belongs] or because it moves the sense with other parts. Or, in other words, something is sensible in act and something is sensible in potency or in power. A sensible quality is infinitely divisible in sensible parts that are called 'sensible' because of this, because they move the sense with other [parts], and not because they can move the sense [on their own] separated from the whole[892].

The striking aspect of this passage is the close resemblance that it bears to the corresponding one at the end of q. 29 of Jandun's commentary, where, as detailed above, Jandun tentatively provides three conditions to allow sensible qualities existing on their own in the actual world without being perceptible in act to be still called 'sensible'[893]. Evidently, Burley's "re-definition" of 'sensible' is much less developed than Jandun's corresponding one, given that Burley only distinguishes between what is called 'sensible' insofar as it is perceptible in act on its own and what is 'sensible', according to Jandun's third condition, because it can become perceptible in act by being united with a sufficient

[892] GUALTERUS BURLAEUS, *Commentarium in De sensu et sensato Aristotelis*, cap. 6, ed. MANSFELD, forthcoming: "Et illa pars dicitur sensibilis non quia per se movet sensum, sed quia cum aliis movet sensum. Unde aliquid dicitur esse sensibile dupliciter: vel quia ipsum separatum a toto potest sentiri vel quia ipsum cum aliis partibus movet sensum. Vel, sub aliis verbis, aliquid est sensibile actu et aliquid est sensibile potentia vel virtute. Qualitas sensibilis est divisibilis in infinitum in partes sensibiles quae propter hoc dicuntur sensibiles, quia cum aliis movent sensum et non quia ipsae separatae a toto possent movere sensum."

[893] This resemblance might reinforce the idea, already suggested, that Burley, upon its arrival in Paris, might have influenced Jandun (and also the anonymous commentator of ms. BnF Lat. 16160) in their respective discussions of *minima sensibilia*. One needs not hypothesise that he did so directly, but, maybe, even merely by contributing to the wider debate that, by all evidence, as I have explained above, was taking place on this issue at the Parisian Faculty of Arts around 1310. This possibility, of course, should not overshadow the distance between Burley's position on *minima sensibilia* and those of Jandun and of the author of the commentary of ms. BnF Lat. 16160.

number of sensible ‘parts’. Nothing, however, close to Jandun’s first two conditions can be found in the passage, probably because Burley was not acquainted with (or in any case did not consider especially problematic) the Averroistic argument concerning the relation between the essence of a given entity and its proper operation that, as seen, is the argument to which Jandun is presumably trying to reply when he “re-defines” the meaning of ‘sensible’.

This does not mean that Burley’s connection to the Oxford tradition is any less strong, however. Indeed, even in this passage there is an aspect that is clearly reminiscent, especially, of the commentary of ms. Oriel 33, namely the fact that Burley explicitly identifies sensible qualities that are perceptible in act on their own with those that are sensible *actu*, whereas the sensible qualities that are not perceptible in act on their own are called sensible *potentia vel virtute*. Nevertheless, contrary to the commentary of ms. Oriel 33, in Burley’s view only sensible qualities that are sensible *actu* are “active”.

When one looks at the *Quaestiones*, and specifically at q. 25, *Utrum qualitates sensibiles dividantur in infinitum*, Burley’s discussion of the ontology and of the epistemology of sensible qualities existing on their own that are not perceptible in act is not fundamentally different, although it becomes far clearer than in the *Commentarium* that Burley believes not only in the existence on their own of "ephemeral" sensible qualities that are not perceptible in act in the actual world, but also of "permanent" sensible qualities of the same kind.

This emerges clearly from the following passage, where, after asking whether it is possible at all that in a given sensible whole there are parts that are not sensible *in actu* on their own[894], he replies in unmistakably clear terms:

> I say that it is [possible], because it is not necessary that an aspect of the whole belongs to any part [of it] whatsoever. So Aristotle in *Physics* Book VII claims <that> a natural quantity of millet seeds falling to the ground causes a sound, a single millet seed, however, not, and the reason of this is because in order for it [i.e., a millet seed] to produce a sound, it must be of a certain quantity (*oportet quod sit determinate quantitatis*), and therefore since a single seed does not have such

[894] GUALTERUS BURLAEUS, *Quaestiones super De sensu et sensato*, q. 25, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Ottob. 2165, f. 62va: “Et estne hoc inpossibile, quod alique partes sunt in toto que sint sensibiles in potentia, que tamen non (*add*.) sunt sensibiles in actu?” Note that here sensible qualities *in actu* keep being those that are perceptible in act on their own, whereas, as the unfolding of the discussion will make clear, sensible qualities *in potentia* are those that, while not being perceptible in act on their own, become sensible by uniting to a sufficient number of sensible qualities exisitng under the same condition. This aspect is therefore perfectly in line with what can be found in the *Commentarium*.

> property under which it was born to produce a sound [i.e., it does not have the power to produce a sound], therefore it does not produce a sound[895].

Burley's argument is, once again, the simple observation that it does not follow from the fact that in a given homogeneous whole a property belongs to the whole, that it also belongs to any of its parts. Correspondingly, Burley uses once again the example of the difference between a certain number of millet seeds and a single millet seed falling to the ground to argue that a sound is only produced in the former case, but not in the latter. What clearly distinguishes this passage from the corresponding one in the *Expositio* is that here no conditional clause can be found anymore: Burley evidently takes the example to apply to the actual world, and therefore he takes its conclusion to be that in the actual world there are sensible qualities existing on their own that are not perceptible in act.

Moreover, when compared with the *Commentarium*, the passage from the *Quaestiones* adds a fundamental aspect to this picture. Indeed, here Burley explicitly claims that in order for a given entity (a material substance) to have the power to produce a sound (a sensation, more in general), and *a fortiori* to produce it in act, such substance must be present under a determined quantity (*oportet quod sit determinate quantitatis*). The idea that a sensible quality, in order to have the power to act on the senses, has to be present under a certain quantity (*sub debita quantitate*, in the most traditional formulation) is an aspect that unmistakably links Burley's discussion here to the Parisian one analysed in the previous two sections, starting with Brito and the authors of the commentaries of ms. Vat. Lat. 2170 of ms. Vat. Lat. 3061 tightly connected to him.

Still, not even in the *Quaestiones* does Burley ever quote any of the two arguments from Averroes' *Long Commentary* on the *Metaphysics* that, as seen, play a prominent role in discussions of this aspect in Jandun's commentary, in the commentary of ms. BnF Lat. 16160 and, finally, in the commentary of ms. Oriel 33. Moreover, Burley's discussion, not even in the *Quaestiones*, adds to this general picture any of the refined developments evident in Jandun's doctrine of *minima sensibilia*. What is explicitly lacking in Burley's discussion is the claim that sensible qualities existing on their own

[895] GUALTERUS BURLAEUS, *Quaestiones super De sensu et sensato*, q. 25, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Ottob. 2165, f. 62va: "Dico quod sic, quia non oportet quod ratio totius competat cuilibet parti. Sic vult Philosophus VII (*ms*. I) *Physicorum* <quod> modu<lu>m naturale plenum (*ms.* unus) granis (*ms.* granus) milii cadens in terram causat sonitum, unum tamen granum milii non, et ratio huius est quia ad hoc quod fiat sonitum oportet quod sit determinate quantitatis (*ms.* qualitatis), et ideo cum unum granum non habeat talem proprietatem sub qua natum est facere sonum, ideo non facit sonum."

that are not perceptible in act possess a disposition to acquire the power to move the senses when united to a sufficiently great quantity of sensible qualities existing under the same condition.

Instead, an aspect that is clearly present in Burley's discussion in the *Quaestiones*, and absent from Jandun's one, as said, is the idea that the process of corruption of extremely small portions of material substances, and of their sensible qualities, is a temporally extended process, so that Burley (contrary to Jandun) is explicitly committed to the existence on their own of "ephemeral" sensible qualities that are not perceptible in act in the actual world during the process of corruption of the portions of matter to which they are united. This emerges clearly from the following passage, which immediately follows the one quoted above:

> Similarly it is concerning such parts of a sensible body [i.e., those that would be corrupted by the containing medium if they were separated from the whole to which they belong]. Indeed, they cannot be separated from the whole, and if they could be separated, they could not move the senses by themselves, if not united to other parts. Hence because of this we say that they are sensible in potency, not because they, once separated [from the whole to which they belong] could remain separate, <but because> they can move the senses [once united] to other parts[896].

The passage is certainly not devoid of ambiguities, especially in the first part, where it seems that Burley, taking a more cautious stance, is even denying that sensible qualities too small to be perceptible in act could exist on their own (in the actual world). Nevertheless, the second part of the passage qualifies what might have appeared as an inconsistent statement, on Burley's behalf, by explaining, once again, that the model he has in mind is one where, as said, sensible qualities too small to be perceptible in act when existing on their own are corrupted by the containing medium once they are separated from the whole to which they belong (so they cannot *manere separate*), yet, since this process unfolds in time, while they tend to corruption (to borrow a useful expression from Oresme's discussion of *minima naturalia*) they still remain sensible, but only in potency, that is, according to the second meaning of 'sensible' identified in the *Expositio*, insofar

[896] GUALTERUS BURLAEUS, *Quaestiones super De sensu et sensato*, q. 25, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Ottob. 2165, f. 62va: "Consimiliter est de talibus partibus corporis sensibilis. Ipse nam non possunt esse separate a toto, neque si possent esse separate, non possunt movere (*ms.* manere, *sed corr. in marg.*) sensus per se nisi coniuncte cum aliis partibus. Unde propter hoc dicimus esse in potentia sensibile<s> non quia ipse separate possent manere separate, <sed quia> ipse cum aliis partibus possunt movere sensus."

as they could become perceptible in act again by being united to a sufficient number of sensible qualities existing under the same condition.

At this point it is also possible to address one last issue that can be clarified by a connected reading of the discussion of *minima sensibilia* in Burley's *Quaestiones*. Indeed, one easy question that could be asked, once it is admitted that Burley accepts both the existence of "permanent" and of "ephemeral" sensible qualities that are not perceptible in act on their own, is how the two categories of sensible qualities relate to each other. The answer comes out quite naturally from the reconstruction I have provided above. While there are some entities in the natural world, those falling within a given size-range, which have a power sufficient to resist to the corrupting action of the containing medium but whose sensible qualities (all or only some of them, as the example of the millet seed makes clear) are not perceptible in act, there is an entire set of smaller entities (or of portions thereof) that are unable to resist to the corrupting action of the containing medium and whose sensible qualities, as a result, come to exist as sensible qualities that are not perceptible in act only during the process of corruption of the substance (or portion thereof) in which they inhere.

4.4.1.2. Walter Burley's Doctrine of *Minima sensibilia*: A Summary

The two commentaries on the *De sensu* that have been attributed to Burley in secondary literature, i.e., the early *Commentarium* and the presumably later *Quaestiones*, present, although with different formulation, a largely analogous doctrine of *minima sensibilia* (which, however, is adopted beyond doubt and in sufficiently explicit terms only in the *Quaestiones*). Burley's position on *minima sensibilia*, and especially on the concept of sensible qualities existing on their own united to portions of matter too small to be perceptible in act, is characterised by two main conceptual developments.

On the one hand, following the adoption of the new temporally extended conception of substantial change, it is fully accepted that any portion of matter, however small, preserves, throughout the process of corruption by the containing medium, not only its substantial form, but also the accidental forms of its sensible qualities. This immediately entails the consequence that sensible qualities existing on their own without being perceptible in act can exist in the actual world, therefore bringing to completion a

process of theoretical change already partially evident in Brito's commentary and in the authors of the commentaries of ms. Vat. Lat. 2170 and of ms. Vat. Lat. 3061 analysed above, with which Burley's commentaries are probably (at least in part) contemporaneous.

On the other hand, Burley also believes that the threshold of perceptibility of sensible qualities is superior to the threshold of their corruptibility. That is, he is committed to the view that, in the actual world, there are entities of a certain size-range whose sensible qualities (all or only some of them) are not perceptible in act on their own. This idea, evidently in common with Jandun (whom Burley might have influenced in this respect, or by whom he might have been influenced, depending on the dating of his *De sensu* commentaries, and especially of the *Quaestiones*), is supported by Burley with recourse to an example drawn from *Physics* VII, already mentioned, yet also tentatively refuted, by Peter of Auvergne. The example claims that while a recipient full of millet seeds, falling to the ground, causes a noise, a single one of them does not. In this sense, while the recipient full of seeds (taken, improperly, as a whole) is sensible (in terms of auditory perception), one of its parts is not. This example is also supplemented by an independent argument in favour of the fact that some parts of an entity that is perceptible in act can exist on their own without being perceptible in act. The argument is based on the claim that what pertains to the whole does not necessarily pertains to all of its parts (this is the exact reverse of a traditional Oxford argument that, since the mid-13th century, had been used in support of the claim that there are no *minima naturalia* in homogeneous material substances).

Both these conceptual developments bring Burley to affirm that, in the actual world, there are sensible qualities that are not perceptible in act on their own (more precisely, of sensible qualities that do not have the power to be perceived in act on their own, therefore sensible qualities that are "inactive", contrary to the Oxford commentary tradition on *minima sensibilia* and in agreement with the Parisian one). Such sensible qualities fall into two distinct categories, which are distinguished by the relevant dimensions of the portions of material substances (or material substances themselves) to which they are united. On the one hand, there are the sensible qualities united with portions of substances (or substances) of sufficient dimensions so as to be able to resist to the corrupting action of the containing medium, yet too small to be perceptible in act.

On the other hand, below the threshold of corruptibility of material substances, there are the sensible qualities that come to exist for a short span of time during the process of corruption of the portions of material substances to which they are united. While I refer to the former as "permanent" sensible qualities that are not perceptible in act on their own, I refer to the latter as "ephemeral" ones.

Moreover, as Burley remarks in the *Commentarium*, the acceptance of the existence on their own, in the actual world, of sensible qualities that are not perceptible in act has the consequence that the traditional definition of 'sensible' must be refined (an aspect that is not too distant from the parallel, yet much more refined, reflection carried out by Jandun in q. 29 of his *De sensu* commentary). An entity can be called 'sensible' either because it can move the senses on its own, or because (using an almost "corpuscularian" formulation) it can do so together with other parts of matter (supposedly endowed with the same sensible qualities).

Nevertheless, all the refined debate developed by Jandun concerning the relation between the essence of a sensible quality and the power to perform its proper operation is entirely absent from Burley's commentaries. The only aspect of this debate that emerges, in the *Quaestiones*, is the idea that, in order for an entity to have the power to act on the external senses so as to engender a sensation, the entity must be of a determined quantity (*determinate quantitatis*). While this formulation unmistakably links Burley with the Parisian discussion of *minima sensibilia* that I have analysed in the first two sections of the chapter, it is certainly closer to the early phase of it (namely, to the commentary by Brito and the two commentaries of ms. Vat. Lat. 2170 and ms. Vat. Lat. 3061) than to the phase to which Jandun's commentary belongs.

Burley’s commentaries, as a result, seem to be situated at an important crossroads in the Medieval Latin debate on *minima sensibilia*. While, indeed, they inaugurate a phase in which the acceptance of the existence on their own, in the actual world, of sensible qualities that are not perceptible in act became the predominant position, they still do not draw all the implications entailed by this major theoretical shift. This, indeed, would have had to wait until, especially, John Buridan’s *De sensu* commentaries, to which I now turn.

4.4.2. John Buridan's Doctrine of *Minima sensibilia*

4.4.2.1. John Buridan on *Minima sensibilia*: The *Insensibilia propter parvitatem* and the Theory of Degree-Species of Sensible Qualities

John Buridan commented on the *De sensu* multiple times, as he did for most other Aristotelian *libri naturales*. Although, lacking any in-depth overall study of the manuscript tradition, it is still difficult to draw any definitive conclusion, what can be said at the current state of research is that there are at least two different versions of Buridan's question commentary on the *De sensu* that have been preserved in manuscript form, to which one should also add at least one version of his litteral commentary[897]. The first (and by far more famous) version of the question commentary is the one that is preserved in most manuscript witnesses[898] and that has also been edited at Paris in 1516 thanks to the

[897] See the Appendix to this thesis for more details in this respect.

[898] They are at least the following ones:

- Ms. Amiens, Bibliothèque Municipale, 402 (15th century), ff. 271-284 (anonymous).
- Ms. Basel, Universitätsbibliothek, F.V.10 (ca. AD 1343), ff. 161r-179v.
- Ms. Basel, Universitätsbibliothek, F.VIII.17 (AD 1422), ff. 133r-164r.
- Ms. Berlin, Staatsbibliothek-Preussische Kulturbesitz, Lat. Fol. 566 (AD 1382), ff. 66r-88r (incomplete and anonymous).
- Ms. Bernkastel-Kues, St. Nikolaus Stift, 187 (Marx) (15th century), ff. 1r-32v (anonymous).
- Ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 11575 (14th-15th century), ff. 92r-109r.
- Ms. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° 357 (end of the 14th century), ff. 131r-148v.
- Ms. Firenze, Biblioteca Medicea Laurenziana, Ashburnham, 1348, ff. 19v-38v (anonymous).
- Ms. Klagenfurt, Bischöfliche Bibliothek, XXXI.b.5 (14th-15th century), ff. 125r-143v.
- Ms. Kraków, Biblioteka Jagellońska, 737 (14th century), ff. 46r-62r (anonymous).
- Ms. Leipzig, Universitätsbibliothek, 1416 (15th century), ff. 234v-248v (incomplete and anonymous).
- Ms. Liège, Bibliothèque de l'Université, 346C (469) (14th-15th century; AD 1370?), ff. 190r-201r (anonymous).
- Ms. München, Bayerische Staatsbibliothek, Clm. 18248 (beginning of the 15th century), ff. 220r-239v.
- Ms. Praha, Knihovna Pražské Metropolitní Kapituly, 1272 (L. XXIX) (AD 1376), ff. 85r-101v.
- Ms. Sankt Gallen, Stiftsbibliothek, 775 (AD 1374), ff. 121-177r.
- Ms. Wien, Österreichische Nationalbibliothek, 5454 (ca. AD 1397), ff. 60r-73r (anonymous).

In addition to these, ms. Kraków, Biblioteka Jagellońska, 704 (14th century) at f. 69r, contains qq. 2-abbreviated.

For further details, see the Appendix to this thesis. A list of *quaestiones* of the whole commentary (based on the Erfurt manuscript and on the Lokert edition) is provided in EBBESEN, THOMSEN THÖRNQVIST, DECAIX, "Questions on *De sensu et sensato, De memoria* and *De somno et vigilia*. A Catalogue", *op. cit.*, pp. 82-84. A critical edition of the text of this version has been published as M. STANEK, *Jana Burydana. Quaestiones super Parva Naturalia Aristotelis. Edycja krytyczna i analiza historyczno-filozoficzna*, Ph.D. thesis, Katowice, Uniwersytet Śląski w Katowicach, 2015, yet, unfortunately, I have not been able to access the text. Q. 3 of the commentary, *Utrum caeci a nativitate habentes auditum debeant esse sapientiores*

editorial work of George Lokert (hence the name of "Lokert edition")[899]. The second one is, instead, only preserved in three manuscript witnesses[900]. The second version, compared with the one of the Lokert edition, is certainly much less developed than it, although fundamentally in agreement with its main conclusions (at least for what concerns the issue of *minima sensibilia*). Still, there are some original aspects that make it worthy of consideration. It is difficult to establish the relative chronology of the two versions of the question commentary. Nevertheless, it is true that one of the manuscript witnesses of the second version, the ms. Milano, Biblioteca Ambrosiana, G.71.Sup, ff. 64r-78r, at the f. 78r, in the *colophon*, dates the course to which the commentary (in the

quam surdi a nativitate habentes visum, has been critically edited in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 184-189, only by making use, however, of ms. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° 357 and of the text printed in the Lokert edition. Q. 21 of the commentary (*Utrum aliquis potest sentire plura simul distincte et perfecte*) has been edited (using the Erfurt manuscript, the two München manuscript, therefore also the one I list among the witnesses of the second version of the commentary, the Sankt Gallen manuscript and the Vatican manuscript) in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 217-225.

[899] IOANNES BURIDANUS, *Questiones et decisiones physicales insignium virorum: Alberti de Saxonia in Octo libros physicorum. Tres libros de coelo et mundo. Duos lib. de generatione et corruptioen. Thimonis in quatuor libros Meteororum. Buridani in Aristotelis. Tres lib. De anima. Lib. de sensu et sensato. Librum de memoria et reminiscentia. Librum de somno et vigilia. Lib. de longitudine et brevitate vitae. Lib. de iuventute et senectute. Recognitae summa accuratione et iudicio magistri GEORGII LOKERT SCOTI: per quem collecta sunt tabulae et proportionum tractatus editi*, Parisiis, apud Jodocum Badium Ascensium et Conradum Resch, 1516, Pars II, ff. XXVIIIv-XLv (what I refer to as the 'Lokert edition'). The edition contains a version of the whole *Quaestiones* on the *Parva naturalia* by Buridan, and also a selection of other *Quaestiones* on Aristotle's *libri naturales* by various 14th-century Parisian masters.

[900] They are the following ones:

- Ms. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2°, F.298 (post AD 1352), ff. 134r-144ra.
- Ms. Milano, Biblioteca Ambrosiana, G.71.Sup. (14th-15th century; for the *De sensu* commentary, AD 1359), ff. 64r-78r.
- Ms. München, Bayerische Staatsbibliothek, Clm. 19551 (AD 1383 for the ff. 2r-31r and AD 1378 for the ff. 36r-145r), ff. 126r-129r.

Note that, of the three manuscripts, only the ms. Milano, Biblioteca Ambrosiana G.71.Sup. contains an attribution of the commentary to Buridan. The existence of this second version of Buridan's *Quaestiones* on the *De sensu* has firstly been pointed out in B. MICHAEL, *Johannes Buridan: Studien zu seinem Leben, seinen Werken und zur Rezeption seiner Theorien im Europa des späten Mittelalters (2 vols.)*, Ph.D. thesis, Berlin, Freie Universität, 1985, Vol. II, p. 742. Michael, however, only lists the first two manuscript witnesses as containing this version, while he claims that the third one presents the version of the text printed in the Lokert edition. Given that I have not been able to examine this manuscript, as the Erfurt one, I cannot properly assess his claim here. Nevertheless, it is clear that at least the *incipit* of the München manuscript is not the one of the Lokert edition, but rather the one of the second version of the text, so that, provisionally, I deem it appropriate to list it under the manuscript witnesses of this second version. It is to be noted, however, that no scholar I am aware of, after Michael, has explicitly admitted the existence of two versions of Buridan's *Quaestiones* on the *De sensu*. I think that not only this is to be regretted, since the existence of these two versions can hardly be denied, but also that a study of the manuscript tradition in this respect is urgently needed. Note, finally, that, as mentioned above, since I have only been able to consult the Ambrosiana manuscript, among the witnesses of the second version of the *Quaestiones*, my analysis of its contents will be based exclusively on this manuscript witness.

form of a student's *reportatio*) refers to 1359, therefore towards the end of Buridan's life, making it likely to think that this text might represent a later version of Buridan's *Quaestiones* on the *De sensu* when compared with the *Quaestiones* of the Lokert edition. This is also confirmed by the fact that, instead, one of the manuscript witnesses of the Lokert version of Buridan's *Quaestiones*, namely, ms. Basel, Universitätsbibliothek, F.V.10, ff. 161r-179v, can likely be dated to ca. 1343, therefore suggesting that Buridan developed this version of the *Quaestiones* before that year and, as such, likely before the second version, which corresponds to his teachings in 1359, therefore at a much later period of his life.

For what concerns the litteral commentary, it is certainly possible to attribute to Buridan the version present both in ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2162 (14th century), ff. 141v-149r, and in ms. Erfurt, Staatliche Bibliothek, Amploniana, 2° F. 298 (*post* 1352), ff. 122r-126v[901]. A different version that has been attributed to Buridan in the secondary literature is the anonymous version preserved in ms. Firenze, Biblioteca Medicea Laurenziana, Ashburnham 1348, ff. 115r-121v. Nevertheless, at the present state of research this version seems to constitute a "re-worked summary" of Buridan's *Expositio* (possibly not even composed by Buridan himself), rather than a truly alternative text, and, what is more, the dating of this "re-worked summary" seems to be likely posterior to 1350[902]. As a result, in what follows I will consider the two versions of the question commentary and the Vatican and Erfurt

[901] The text of the *Expositio* dealing with *De sensu* 7 (the eigth chapter of the commentary) has been edited (using these two manuscripts) in TOIVANEN, " Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 209-216.

[902] A comparison of selected passages of the *Expositio* of the *De sensu* contained in the Florentine manuscript with the version preserved in the Erfurt and the Vatican manuscripts has been carried out in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 135-138. Toivanen's conclusion is the following one: "I have not made a thorough comparison between the two redactions, but my impression is that the main points and the general progression of the arguments are the same. Yet, the wording of F [i.e., the Florentine manuscript] often differs quite radically from the other two manuscripts, and the differences from the version we find in E V [i.e., the Erfurt and Vatican manuscripts] are so constant and significant that for the most part F does not help in establishing the base text of E and V" (*ibid*., p. 136). Toivanen is rightly cautious in denying a Buridanian attribution for the Florentine version of the *Expositio*, but, as said, my hypothesis (mostly based on the examples provided by Toivanen himself and by an analysis of the portion of text dealing with *De sensu* 6, 445b3-446a20), is that the Florentine version is too impoverished a text to represent an "authentic" alternative version of Buridan's *Expositio* (that, as I will show below, is already a very "essential" text when compared with his question commentaries). Nevertheless, given the resemblances that the text bears to Buridan's *Expositio*, I think that it can rightly be classified as a "re-worked summary" of the *Expositio* itself, probably prepared for a master who wanted to have access to Buridan's teachings in the *Expositio*, or even for a student. It goes without saying that such a hypothesis might only be verified by a fuller comparison (and critical edition) of the texts.

version of the litteral one, since the Florentine version of the *Expositio* seems to lie outside the scope of the present thesis.

Buridan's discussion on *minima sensibilia* in the *Quaestiones* published in the Lokert edition (specifically in q. 19, *Utrum passiones sensibiles sunt in infinitum divisibiles*) is significantly different from all the discussions that have been encountered until now in this chapter and also in the preceding one, and it bears witness to the fact that, chronologically and theoretically, it is the first among the commentaries analysed in this chapter that belongs to the period of "mature" 14th-century Aristotelian natural philosophy. Indeed, in it all the three elements that, as I have argued in the second chapter, distinguish the "mature" 14th-century Latin debate on *minima naturalia* from the preceding one, also feature prominently. Specifically, when compared with those of his predecessors, Buridan's discussion is significantly more "empirical", it bears the mark of an increasing "mathematisation" and, what is more, it also clearly refers to the distinction between God's *potentia ordinata* and *potentia absoluta*[903]. Instances of all of these aspects will be illustrated in what follows. Nevertheless, the main (and most specific) element of originality of Buridan's discussion of *minima sensibilia* when compared with the previous ones, one that clearly attests to the fact that the Medieval Latin debate on *minima sensibilia* had entered a new phase of development, is the fact that the greatest part of his discussion is devoted to illustrating in detail the new ontology and epistemology of sensible qualities that exist on their own, in the actual world, without being perceptible in act[904].

[903] On the significance for this distinction in "mature" 14th-century Latin natural philosophy (also in the wider context of the development of the distinction in Late Medieval Scholasticism), see the literature quoted in Chapter 2 of the present thesis.

[904] Here, it is important to clarify an important issue. Indeed, throughout the chapter (partially analogously to what said in Chapter 2 concerning *minima naturalia*), I have claimed that Burley and Buridan belong to the same "phase" of the development of the Medieval Latin debate on *minima sensibilia*, in special connection with the new conception of the ontology and the epistemology of sensible qualities that can be found, to different extents, in their respective *De sensu* commentaries. Such a claim might sound strange considering that Burley's overall ontology is a realist one, whereas Buridan's one is nominalistic. Still, I think that, on the one hand, the overall metaphysical framework of the two authors does not play any important role when dealing with this specific debate in natural philosophy (and, indeed, nowhere in their discussions of *minima sensibilia* – or of *minima naturalia*, for that matter – do these two authors refer to their overall realist or nominalist metaphysics). On the other hand, when I refer to the 'ontology' of sensible qualities, I mostly refer to the relation between the essence, existence and proper operation of sensible qualities, whereas when I refer to the 'epistemology' of sensible qualities I mostly refer to the conditions of perceptibility (in potency and in act) of sensible qualities themselves. The two terms, therefore, should not be taken to refer, in this context, to much more than these very specific aspects.

Indeed, as already mentioned above, starting at least with Walter Burley's commentaries, the existence on their own in the actual world of sensible qualities united to portions of matter too small to be perceptible in act had been accepted, thanks to two reasons. The first one is the adoption of a new, temporally extended conception of substantial change (that Buridan, as seen in the second chapter of the thesis, ultimately shared, although in the form of what I have called the "piecemeal" conception of substantial change, rather than in the form of Burley's view of corruption as the inclusive limit of alteration). Still, as said, this aspect can, at best, ground the acceptance of the existence on their own in the actual world of "ephemerous" sensible qualities that are not perceptible in act, that is, sensible qualities that are not perceptible in act that come to exist during the process of corruption of the portions of material substances to which they are united.

Instead, the main reason that brings Buridan to accept the existence on their own, in the actual world, of sensible qualities that are not perceptible in act is the idea, probably influenced by Jandun (but possibly also by Burley), that the threshold of corruptibility of sensible qualities is inferior to their threshold of perceptibility. This aspect grounds a belief in the existence on their own, in the actual world, of "permanent" sensible qualities that are not perceptible in act (a class of entities that Buridan denotes using the expression of *insensibilia propter parvitatem*). It is this aspect, and the corresponding notion of *insensibilia propter parvitate*m, that lies at the centre of Buridan's discussion of *minima sensibilia*, much more than the "piecemeal" view of substantial change and its corresponding notion of "ephemeral" sensible qualities existing on their own, in the actual world, without being perceptible in act.

While analysing *insensibilia propter parvitatem*, Buridan's foremost concern is the epistemological one concerning the limits of perception by the external senses, in this way clearly distinguishing himself from Jandun's most prominently ontological analysis. As I have shown in the previous chapter, there is at least a (partial) precedent for linking the epistemological issue of the limits of perception to that of *minima sensibilia*, namely, Peter of Auvergne, who, in his *De sensu* commentary, refers multiple times to the issue of the maximal distance from which perception can occur in the context of his discussion on *minima sensibilia*. Nevertheless, in Peter's text this issue remains a marginal aspect, one that does not affect in any way the core of the discussion. In Buridan's text, however,

once the existence of *insensibilia propter parvitatem* is accepted, discussing the limits of perception becomes crucial in order to properly delimit the realm of such *insensibilia propter parvitatem*. Buridan's strategy, however, is that of inserting the discussion in a larger framework, as it is evident from the first occurrence of *insensibilia propter parvitatem* in q. 19 of the *Quaestiones* in the version of the Lokert edition, while introducing the arguments *quod non*:

> Moreover, it would follow [if sensible qualities were infinitely divisible] that no magnitude would be insensible due to its smallness (*insensibilis propter parvitatem*). The consequent is false, therefore also the antecedent. The falsity of the consequent appears by Aristotle when he says that certain magnitudes and passions escape [the senses] due to [their] smallness, and this also appears by an argument taken from an experiment. Indeed, often a young man having a sharp sight perceives a certain small body that an old man having a weak sight cannot perceive; this is [commonly] experienced. After [Aristotle] adds that it is experienced that the more such small body is made smaller, the more difficult it will be seen, if it is seen [at all]. Let us therefore take a proportion according to which the eye of the young man was stronger or sharper than the eye of the old man, and let it be in the double. Then, if that visible body were divided, the eye of the young man would be capable of perceiving the half [of that body] such as the eye of the old man will be able to perceive the whole, because as much as the eye of the young man was stronger, so much that half [of the visible body] is more difficult to be seen than it was the whole. Therefore when the eye of the old man does not see the whole, the eye of the young man does not see the half [of the visible body], and so it appears that some magnitudes are insensible due to [their] smallness[905].

Buridan is keenly aware of the fact that, above what could be called "absolute" *insensibilia propter parvitatem*, there are magnitudes that, while being perceptible under appropriate conditions, can become *insensibilia* due to the fact that, for instance, the observer is too distant from the sensible quality to be perceived, or, to keep to Buridan's example (which already shows his strong interest for "empirical", and even

[905] IOANNES BURIDANUS, *Quaestiones super De sensu et sensato*, q. 19, Parisiis 1516, f. 38vb: "Item, sequeretur quod nulla magnitudo esset insensibilis propter parvitatem. Consequens est falsum, igitur et antecedens. Falsitas consequentis apparet per Aristoteleme dicentem quod quedam magnitudines et passiones latent propter parvitatem, et hoc etiam apparet ratione sumpta ex experimento. Sepe enim iuvenis habens acutum visum percipit aliquod corpus parvum quod antiquus habens debilem visum non potest percipere; hoc est expertum. Postea addit et est expertum quod quanto tale corpus parvum magis diminueretur tanto difficilius videretur si videretur. Sumamus ergo proportionem secundum quam oculum iuvenis erat fortior sive acutior quam oculus senis, et sit in duplo. Tunc si illud visibile divideretur, oculus iuvenis se habebit ad medietatem sicut oculus senis se habebit ad totum, quoniam quanto oculus iuvenis erat fortior tanto illa medietas est difficilius visibilis quam esset totum. Ergo cum oculus senis non videret totum, oculus iuvenis non videret medietatem. Et sic patet quod aliquas magnitudines sunt insensibiles propter parvitatem."

"experimental[906]", issues, that will become clearer in what follows, and also his use of numerical proportions in the context of the discussion of *minima sensibilia*), that the sight of the observer is not as good as the one of a younger or healthier one, so that, from a given distance, the younger or healthier observer can perceive a certain sensible quailty that, for the former one, will remain an *insensibile*. Of course, there remains a fundamental ontological and epistemological difference between "absolute" and "relative" *insensibilia propter parvitatem*, which Buridan certainly does not want to take away. His introductory discussion of the issue, rather, seems to constitute a rhetorical strategy aimed at making the notion of *insensibilia propter parvitatem* more acceptable to his audience, by introducing it as part of a discussion centred around everyday experiences[907]. This should not come as a surprise, if one just recalls all the hesitations and *excusationes* expressed by Jandun while first introducing the notion of "permanent" sensible qualities existing on their own, in the actual world, that are not perceptible in act, in q. 30 of his *De sensu* commentary. True, Jandun was still presenting a very new conception, whereas such a conception had already become more widespread at Buridan's time; nevertheless, its "relative" novelty might still justify an attempt, without any explicit *excusatio*, to adopt other, less radical, rhetorical devices to make such a conception acceptable to the audience.

In order to find, however, a proper characterisation of the epistemology of "absolute" *insensibilia propter parvitatem* (always in connection with their ontological characterisation) one has to wait until the last part of Buridan's *determinatio*:

> But then remains a doubt: whether any entity whatever is sensible or some is insensible due to [its] smallness. The reply according to Aristotle is by way of multiple conclusions. The first conclusion is that any part of the sun or of the moon even smaller than a millet seed sometimes is perceived and seen by us on [its] surface [when it is turned] towards us, because the whole surface is seen, therefore any part is seen, and about this you will see Aristotle's reasoning in the text. The second conclusion [is] that no part which can remain [in existence] by itself on its own is invisible due to [its] smallness, even though it exists on its own as a matter of fact in such [smallness]. [This is proved because of the fact] that I can see a black ant against the sun even though [it is] not in continuity or even in contiguity to the sun or to another black [body], because I posit the case that God makes and preserves before the sun black ants in such width as the sun is, and that are extremely close to each

[906] On the use of the term of *experimentum* in the context of Buridan's natural philosophy, see the references already provided in Chapter 2 of the thesis.
[907] Although one should never forget that the appeal to everyday experiences is a usual feature of Buridan's works, at least those in the field of natural philosophy.

other or in contact; those [ants] will obscure the sun to me and [they] will make [it] appear black or of a middle color[908]. This would not be if [all of them] were not seen, since, however, any [of them is] separate from [any] other and exists in the [face of the] sun; and, as Aristotle says that if all the surface is seen any part [of it] is seen, so if all that aggregation is seen any ant whatsoever is seen, and so it would be in a natural case if black seeds [were] on a white area extremely close to each other: from any distance whatsoever that area will be seen, from that distance those seeds will be seen, because through their perception the area will be judged [to be] black. The last conclusion is according to Aristotle, [namely] that not any [of them] is seen distinctly (*distincte*) for what concerns this sense, [so] that someone could distinguish this from that. Indeed, it is neither possible to perceive an ant in the sky nor a millet seed from afar, and anybody makes the experience of this. Indeed, [he] could not, by distinguishing from afar, count how many are the ants or the millet seeds, and in this way is expounded the *auctoritas* that posits magnitudes or passions which are not sensible due to [their] smallness (*magnitudines vel passiones insensibiles propter parvitatem*)[909].

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[908] Note that this is the first passage in Buridan's discussion of *minima sensibilia* in the *Quaestiones* of the Lokert edition where the absolute power of God is not merely invoked in a "negative" sense to set a boundary to the discussion (therefore specifying that the discussion is only limited to the regular course of nature under God's ordained power), but rather, positively, to contribute to the discussion with the addition of a new and important example. Note, however, that this does not mean that here Buridan is moving the plane of the discussion from the context of God's ordained power to that of His absolute power. Indeed, as the second example in this same passage will make clear, the case Buridan is discussing is not only a case that belongs to the ordinary course of nature, but, even more, to everyday experience. The use of an example that invokes God's absolute power in this context, therefore, seems to be motivated by Buridan's desire to identify a clearer (and, indeed, more effective) example than the one that could be supplied by having recourse to the regular course of nature. This is therefore an instance of what Biard calls "l'usage méthodologique de la toute-puissance", that is, a reference to God's absolute power as an instrument "[...] pour formuler des hypothèses de nature physique ou métaphysique [...]" (BIARD, *Science et nature. La théorie buridanienne du savoir*, *op. cit.*, p. 359; but, on this issue, see more generally pp. 359-360). A study of Buridan's use of the arguments from God's absolute power which goes in the same direction (although focusing mostly on the problem of the certainty of knowledge) is also REINA, *L'ipotesi del* casus supernaturaliter possibilis *in Giovanni Buridano*, *op. cit.* Note that Biard provides a very useful typology of the various ways in which Buridan uses the notion of God's absolute power in philosophical reasoning (cf. BIARD, *Science et nature. La théorie buridanienne du savoir*, *op. cit.*, pp. 358-367).

[909] IOANNES BURIDANUS, *Quaestiones super De sensu et sensato*, q. 19, Parisiis 1516, f. 39va: "Sed tunc restat dubitatio, utrum quelibet est sensibilis an aliqua est insensibilis propter parvitatem. Responsio secundum Aristotelem est per plures conclusiones. Prima conclusio est quod quelibet pars solis vel lune etiam minor quam granum milii saltem in superficie versus nos sentitur et videtur a nobis, quia tota superficies videtur, ergo quelibet pars videtur, et de hoc videatis processum Aristotelis in lit<t>tera. Secunda conclusio, quod nulla pars possibilis per se seorsum remanere esset invisibilis propter parvitatem, licet seorsum existeret de facto in tantam <parvitatem>. Quod ego possem videre formicam nigram iuxta solem, licet non sit continuata el etiam contiguata soli aut alteri nigro, quia ego pono casum quod Deus ante solem faciat et conservet formicas nigras in tanta latitudine quanta est sol, et que sint valde propinqua ad invicem sive cum contactu. Illa oscurabunt mihi solem et facient apparere[t] nigrum vel medii coloris. Hoc non esset nisi viderentur, cum tamen quelibet seorsum ab alia et sole consistat, et sicut dicit Aristoteles quod si tota superficies videtur quelibet pars videtur, ita si tota illa congregatio videtur quelibet formica videtur, et ita esset per casum naturalem si grana nigra super albam aream valde prope adinvicem. A quantacumque distantia videretur illa area, ab illa distantia viderentur illa grana, quia per eorum visionem iudicaretur area nigra. Ultima conclusio est secundum Aristotelem quod non quelibet videtur distincte ad istum sensum quod quis possit ab illa hanc distinguere. Immo nec sit percipere[t] formicam in celo nec granum milii a longe, et hoc quilibet experitur. Non enim posset a longe disitnguendo numerare quot essent formice vel grana milii. Et ad istum etiam sensum exponeretur auctoritas que ponit magnitudines vel passiones insensibiles propter parvitatem."

The first aspect to remark in the passage quoted is that, as Buridan unambiguously states in the second conclusion, there is no ("absolute") *insensibile propter parvitatem* that cannot become perceptible in act by becoming part of a larger aggregate of *insensibilia propter parvitatem*, although it is not perceptible in act on its own. Here Buridan clearly resorts to a "corpuscularian" model (analogous to the one that had been proposed by Jandun) to explain in what way *insensibilia propter parvitatem* are the ultimate components of sensible qualities that are perceptible in act. Indeed, a central aspect of Jandun's analysis of the notion of sensible qualities existing on their own without being perceptible in act was the idea that, according to the third meaning of potentially perceptible proposed by Aristotle and developed by Alexander of Aphrodisias, such sensible qualities could have become perceptible in act by uniting to a sufficient quantity of sensible qualities existing under the same condition.

Jandun did not provide any concrete example of this "corpuscularian" model (whereas it might be argued that Burley's example of the recipient full of millet seeds and of the single millet seed could be read in this direction). Buridan, instead, chooses to provide two of them. The first one is a bizarre thought experiment whose possibility is directly linked to a reference to God's absolute power. This example, like the second one (the one concerning millet seeds), is not entirely appropriate, since it refers to entities that are not "absolute" *insensibilia propter parvitatem*, namely, ants. Still, I think that Buridan is using it here merely for the sake of an increased effectiveness. The thought experiment is clear: such as a single ant "suspended into air" between the visible surface of the sun and a given observer cannot be seen, at least from a certain distance, due to its smallness, such ant becomes perceptible in act as part of a line formed by a succession of contiguous (yet, importantly, not continuous) ants stretching throughout the whole visible surface of the sun without interruption from one extreme to the other one. Buridan explicitly conceives the end result of his thought experiment in analogy with the way in which the parts of a visible surface (such as that of the sun, to remain within the boundaries of Buridan's thought experiment) can be said to be perceived in act when the whole surface is perceived in act, that is, according to Aristotle's first meaning of potentially perceptible. As a result, Buridan's idea seems to be that *insensibilia propter parvitatem* (being presumably "inactive" while existing in isolation, according to a feature typical of the

Parisian commentary tradition on *minima sensibilia*) can become perceptible as part of larger aggregates endowed with the same sensible qualities (at the limit entities of the same species), only by giving rise to a numerically distinct and overarching sensible quality formed by their aggregation. Indeed, in Buridan's thought experiment, although the ants themselves evidently do not become part of a single entity (so that they are only, at the limit, contiguous, and never truly continuous with each other), Buridan clearly says that there is no way to perceive the blackness of each ant *distinctly* (*distincte*) within the line. The same idea is, then, illustrated by Buridan by making reference to the case (belonging to the ordinary course of nature) of a set of (black) millet seeds covering a white area. Even in this case, from a certain distance a single millet seed will not be perceptible in act on its own, but the set of seeds extremely close (touching, or even contiguous) to each other will be, and so each of them will be as part of this set.

Apart from the issue of *insensibilia propter parvitatem*, there is another aspect that is of great interest for the present thesis in Buridan's discussion of *De sensu* 6, 445b3-446a20 in the *Quaestiones* of the Lokert edition, one which, in this case, does not find any precedent whatsoever in the previous Latin commentary tradition on *De sensu* 6, 445b3-446a20. This is Buridan's discussion (in the context of his commentary on *De sensu* 6, 445b3-446a20), of the division of sensible qualities in degrees, that is, the issue traditionally known, in secondary literature, as that of the intension and remission of (accidental) forms[910]. This issue takes centre stage when Buridan discusses the division *per se* of sensible qualities, that is, the one traditionally understood as merely concerning

[910] Some aspects of Buridan's position on this subject have been analysed by modern scholars, but mostly in reference to Buridan's discussion in qq. 3-5 of Buridan's commentary *de ultima lectura* on *Physics* III, together with his commentary *de tertia lectura* (cf. J. BIARD, "L'être et la mesure dans l'intension et la rémission des formes (Jean Buridan, Blaise de Parme)", *Medioevo. Rivista di storia della filosofia medievale* XXVII, 2002, pp. 415-447, ID., *Science et nature. La théorie buridanienne du savoir*, *op. cit.*, pp. 333-344, and S. CAROTI, "Some Remarks on Buridan's Discussion on Intension and Remission", *Vivarium* 42 (1) (2004), pp. 58-85). Still, a comprehensive study concerning Buridan's position on intension and remission of accidental forms is still lacking, and it clearly represents a *desideratum* of research in "mature" 14th-century Parisian natural philosophy (for a better understanding of the overall lines of development of the Parisian debate on intension and remission of accidental forms in the first half of the 14th century and, therefore, of the wider context of Buridan's discussion, see S. ROUDAUT, *La mesure de l'être. Le problème de la quantification des formes au Moyen Âge (ca. 1250-1370) (History of Metaphysics: Ancient, Medieval, Modern 3)*, Leiden-Boston, MA, Brill, 2022, esp. pp. 208-241; on Buridan's position specifically, and on its influence, see pp. 217-226), . In what follows I clearly do not aim to provide it, but rather, and more modestly, to add a contribution to understanding Buridan's views by looking at the way in which he discusses the topic in q. 19 of his *Quaestiones* on the *De sensu* according to the Lokert edition. Indeed, no available publication on the issue, as far as I know, has ever noticed that Buridan discusses the issue in this place, or, more generally, in commenting upon the *De sensu*.

the division of sensible qualities in species within genera, but it is also an important aspect of Buridan's solution with respect to the issue of the division *per accidens* of sensible qualities.

One aspect that is important to remark from the outset is that Buridan's overall position on the issue of the intension and remission of forms is what could be called an "admixture theory". Following Elzbieta Jung's recent definition, such a position is a position according to which:

> [...] two contrary qualities of the same pair, like coldness and heat, can exist simultaneously with various intensity in the same subject. The sum of degrees of intensity of both qualities, however, must be constant. Thus in the qualitative change such as heating, when heat increases, coldness simultaneously decreases in the same degree. A qualitative change is then a process of "freeing from admixture" of the opposite quality[911].

It goes without saying that, according to such a theory, any quality whatsoever possesses distinct degrees (interpreted as "intensive parts") that can be subject to measurement, not (only) as degrees instantiated in given material substances, but also as abstract ones, that is, as degrees of qualities insofar as mere forms. In q. 19 of the *Quaestiones* on the *De sensu* in the Lokert edition, Buridan creatively connects this aspect to the issue of the divisibility of sensible qualities. As already mentioned, he does so first and foremost in connection with the issue of the divisibility *per se* of sensible qualities, an issue that had normally been understood by previous commentators to refer merely to the division of genera of sensible qualities into their species. Buridan is certainly not ignorant of this aspect, since he starts his discussion exactly by referring to the traditional issue of the division of genera of sensible qualities into their species (although he questions, again in an original way, the general validity of the traditional Aristotelian argument based on the fact that between two contrary extremes there is a finite number of intermediate

[911] E. JUNG, *Intension and Remission of Forms*, in H. LAGERLUND (ed.), *Encyclopedia of Medieval Philosophy. Philosophy between 500 and 1500. Second Edition*, Cham, Springer, 2020, pp. 848-853, p. 851. One clarification that it is important to add to this presentation of Buridan's view is that, as remarked by BIARD, *Science et nature. La théorie buridanienne du savoir*, *op. cit.*, pp. 341-343, and by ROUDAUT, *La mesure de l'être. Le problème de la quantification des formes au Moyen Âge (ca. 1250-1370)*, *op. cit.*, pp. 221-222, what cannot truly be present simultaneously in a same substance are the two extreme degrees of contrary qualities, whereas their intermediate degrees are not really contrary and can, therefore, be present simultaneously in the same substance, provided that the total sum of the intensity of the two contrary qualities concerned remains the same.

entities[912]). Nevertheless, after this discussion he explicitly raises the issue of the division of the species of sensible qualities in degrees as a kind of *per se* division of sensible qualities. Although he starts his discussion by referring to the case of colours, the most problematic case (and the one that best illustrates, in Buridan's view, why the issue of degrees is connected to that of the *per se* division of sensible qualities) is that of the primary qualities, as proper sensibles of the sense of touch. Buridan, in particular, mentions the csae of heat and coldness. In this case, indeed, the intermediate "species" between the two extremes in which the genus including them should be divided simply *are* the intermediate degrees of heat and coldness. Buridan's discussion of whether between heat and coldness there are intermediate species-degrees, and whether they are finite or infinite, is in the following terms:

> Because of this doubt let it be posited first a difficulty: whether between hot and cold there is another species and, if so, whether it is one or more [than one]. And we can reply that between hot and cold there is a middle species, either by denying the extremes, because [there is something that is] neither purely hot nor purely cold, or by participation of the extremes, because [there is something that is] the result of a mixture of some degrees of heat and some degrees of coldness, and I call that warm (*tepidum*), so that those three terms, 'hot', 'cold', 'warm', are three species of the quality. Whether, however, there are more species between hot and cold, I believe it must be said that there are not, unless if they were posited to be infinite, because if between hot and cold there were another species that is called 'B', because of this, that from hot one moves in a continuous way to warm through the intermediate that is called B, so by the same argument there would be another intermediate species between hot and B, which is called 'C', and again between hot and C [there would be another species] that is called 'D', and so on to infinity. And because Aristotle denies this infinity of species I believe that between hot and cold it must be posited only one species, at least in absolute terms; but it would not be inconvenient to me to posit infinite comparative species, or infinite distinct comparative terms, such as 'hot in the double', 'hot in the triple', and so on to infinity. If, indeed, there would be a motion from the hottest to the coldest [degree], that would be made less hot in infinity according to the infinitely diverse proportions which are called with names different in species[913].

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[912] More specifically, Buridan questions the fact that in any continuous entity, such as a line (a line segment), there is a finite number of intermediates, insofar as such continuous entity is (potentially) infinitely divisible. Still, insofar as species of accidental forms are discrete entities, this does not apply to them: "Sed contra istam rationem obiicitur, quia linea finita habet bene duo extrema ut duo puncta, et tamen inter illa duo extrema sunt infinite partes linee, cuius oppositum dictum est. respondeo quod non est inconveniens infinita quantitative inter duo extrema qui habent adinvicem continuationem esse, sed sic non est possibile de infinitis secundum speciem distinctis. Hoc enim non est possibile nisi propter continuationem, eo quod de ratione continui est quod sit in infinitum divisibile" (IOANNES BURIDANUS, *Quaestiones super De sensu et sensato*, Parisiis 1516, f. 39ra). On Buridan's position concerning the continuity and (potential) infinite divisibility of magnitudes, see Chapter 1 of the present thesis.

[913] IOANNES BURIDANUS, *Quaestiones super De sensu et sensato*, q. 19, Parisiis 1516, f. 39ra-b: "Propter istam dubitationem ponatur primo difficultas: utrum inter calidum et frigidum sit alia species, et si sic utrum

Buridan's position, therefore, tends to admit a (potential) infinity of intermediate degrees-species of heat and coldness, according to the fact that the degrees identify a continuous succession between a maximum and a minimum of heat (or a minimum and a maximum of coldness, respectively), a succession which can be represented by numerical proportions. Given that, insofar as it is continuous, such succession is also (potentially) infinitely divisible, and given that there is no reason to deny that any such degree can be called a 'species' of heat and coldness, Buridan can easily conclude to the existence of a (potentially) infinite number of intermediate "species" of heat and coldness[914].

This conclusion in itself is of paramount importance for the overall Medieval Latin debate on the divisibility of sensible qualities, insofar as, for the first time, it is openly admitted that even without considering the division of the matter of the material substance in which sensible qualities inhere, such qualities *in themselves* possess a "continuous structure" (and, at least in principle, a quantitatively measurable one, insofar as such degrees are measurable in quantitative terms). Therefore, as such, these qualities are subject *per se*, considered abstractly, without reference to their instantiation in a

sit una an plures. Et possumus respondere quod inter calidum et frigidum est species media, vel per negationem extremorum, quia nec pure calidum nec pure frigidum, vel per participationem extremorum, quia mixtum ex aliquibus gradibus caliditatis et aliquibus gradibus frigiditatis, et illud vocetur tepideum, ita quod illi tres termini 'calidum', 'frigidum', 'tepidum', sunt tres species qualitatis. Utrum autem sint plures species inter calidum et frigidum, credo dicendum quod non, nisi ponerentur esse infinite, quia si inter calidum et frigidum esset alia species qui vocaretur 'b', propter hoc quod de calido transitur continue ad tepidum per medium quod vocaretur 'b', ita pari ratione esset alia species media inter calidum et b qui vocaretur 'c', et iterum inter calidum et c que vocaretur 'd', et sic in infinitum. Et quia Aristoteles negat istam infinitatem specierum credo quod inter calidum et frigidum ponenda sit una sola species, saltem quantum ad terminos absolutos; sed non esset mihi inconveniens infinitas species comperativas seu infinitos terminos comperativos distinctos ponere, ut in duplo calidius, in triplo calidius et sic in infinitum. Si enim fiat motus de calidissimo ad frigidissimum, illud in infinitum fiat minus calidum et secundum infinitas diversas proportiones qui nominibus specie diversis nominarentur."

[914] Of course, if, within any degree of intensity of a given quality there is, potentially, an infinity of degrees, it is difficult to understand how it is possible to compare different degrees of intensity of the same quality. Buridan's solution, as noted by Biard, is to consider that a given degree of intensity can be taken as unit of measurement for the other degrees. As he puts it: "La difficulté se résout par une comparaison avec la mesure d'une grandeur. Si une grandeur d'un pied et une grandeur de deux pieds ont chacune une infinité (potentielle) de parties, on semble ne pas pouvoir dire que l'une est plus grande que l'autre. Pourtant, on peut comparer une grandeur à une autre parce qu'une grandeur de deux pieds contient une grandeur d'un pied *et quelque chose en plus*. L'application d'une grandeur déterminée prise comme critére permet donc la comparaison et la mesure" (BIARD, *Science et nature. La théorie buridanienne du savoir, op. cit.*, p. 338; emphasis in the original). Buridan's fundamental passage quoted by Biard in this context is from q. III.5 of the *ultima lectura* on the *Physics*: "Ita etiam caliditas a non dicitur intensior caliditate b quia habeat plures partes graduales, quia utraque infinitas habet, sed quia habet plures tantas quanta est signata, vel signabilis, aut quia tantumdem et amplius" (quoted in BIARD, *Science et nature. La théorie buridanienne du savoir*, *op. cit.*, p. 339, n. 1).

material substance, to the same kind of (potentially) infinite process of division to which they are subject *per accidens* insofar as they are united to material substances. More than that, the continuous structure of degrees is, at least for primary qualities, the only structure that such qualities possess, insofar as degrees are the only intermediate species of them that can be admitted. This is an aspect that would deserve further developments, which, unfortunately, cannot be inserted here. Nevertheless, given the innovative character of Buridan's theoretical proposal, a few more words are probably needed at this point. Indeed, at least since the 13th century, a certain number of theories concerning the *intensio* and *remissio* of accidental forms had come to attribute to the accidental forms of qualities an intrinsic structure made of degrees; that is, they had come to think of degrees of intensity as intensive parts of qualities considered in themselves, that is, abstracted from any material substance whatsoever (one early case in point is certainly Henry of Ghent[915]). What is, however, substantially new in Buridan's theory is the fact that this structure acquires a new doctrinal status. Indeed, by identifying degrees and species Buridan opens the way to the possibility of conceiving not only primary qualities, but also all other sensible qualities (something, however, he ultimately refrains from doing) as only possessing degree-species. That is, the "discreteness" that, traditionally, characterised at least the intermediate species of all secondary sensible qualities in the previous tradition, under Buridan's analysis starts to collapse, and, at least in principle, it becomes for the first time possible to "do away completely", so to speak, with a notion of '(intermediate) species' of a sensible quality different from the notion of '(intermediate) degree' of a sensible quality.

Buridan is certainly aware of the innovative character of his approach to the issue of the *per se* divisibility of sensible qualities, and he tries to temper it with respect to the (secondary) sensible qualities that are the proper sensibles of the other senses. Indeed, when discussing the case of colours (but quoting also those of odours and flavours), he states that, in their case, there is a finite number of intermediate species, insofar as the process of their constitution does not depend on a “mixture” of their extremes (as Aristotle would have claimed), but rather it involves the direct intervention of primary qualities

[915] On this aspect, see for instance J.F. WIPPEL, "Godfrey of Fontaines on Intension and Remission of Accidental Forms", *Franciscan Studies* 39, 1979, pp. 316-355, pp. 322-324.

themselves[916]. Buridan does not provide any further detail, in this context, concerning the constitution of the intermediate species of secondary sensible qualities, but the attempt to provide a *sui generis* theory concerning their generation is enough, I believe, to claim that he is here trying to limit the extremely innovative consequences of his theory concerning primary sensible qualities.

For what concerns the present thesis, however, the most important question to examine is whether this innovative aspect has any consequence for the issue of *minima sensibilia* properly understood, that is, for the issue of the divisibility *per accidens* of sensible qualities. The answer is positive, although with some important qualifications. To understand this, one should first look at the taxonomy that Buridan provides concerning the kinds of quantitative division that a material substance (and therefore, accidentally, the forms of its sensible qualities) can undergo:

> Now it remains to talk of the division of these [sensible qualities] in the way of an integral whole in its integral parts, and it can be imagined a triple way of division of an integral whole in its integral parts. The first way [is] really commonly mentioned, and it signifies that the same whole is divided in its parts, insofar as it has parts that compose it. So, indeed, the sky or the sun or the moon is said to be divided in its integral parts, apart from this [fact], that some parts are not separated from each other unless according to reason [...]. The second way of division is through the real separation of a part from a part with the survival of the parts, so that from those parts it is not [formed] a whole anymore. The third way of division is through the corruption of a part while another remains. So, according to Aristotle, a substantial compound [i.e., a material substance] would be divided in matter and form, because the form is corrupted, while the matter remains[917].

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[916] IOANNES BURIDANUS, *Quaestiones super De sensu et sensato*, q. 19, Parisiis 1516, f. 39rb: "Sed tunc iterum reverteretur difficultas, utrum sit ita de coloribus et de saporibus, videlicet utrum inter album et nigrum sit una sola species an sint plures, et si plures utrum infinite. Respondetur quod sunt plures et diverse species colorum preter illas species album et nigrum, verbi gratia rubrum, croceum, viride et forte etiam pallidum et fuscum, sed tamen non sunt infinite. Sed tunc queritur quare ita diversimode dicimus de calido et frigido ex una parte et de albo et de nigro ex alia parte. Respondendum est quod calidum et frigidum per actionem et passionem eorum adinvicem et per solam mixtionem graduum caliditatis cum gradibus frigiditatis constituunt omnia sua media, propter quod illa media omnia sub una specie ponuntur, sed album et nigrum non sic constituunt sua media, quia non agunt adinvicem. Immo illa media ex pluribus aliis agentibus et specie diversis et ex diversis modis actionum, scilicet qualitatum primarum adinvicem, proveniunt colores medii et sapores medii et odores medii. Immo etiam et extremi a qua diversitate agentium et modorum agendi illi colores fiunt diversarum rationum et multarum specierum. Unde etiam propter hoc est quod si de calidissimo fiat frigidissimum oportet transire per omnia media sive per omnes proportiones medis, sed ex albissimo posset fieri nigerrimum, quamvis numquam transitertur per rubrum, croceum, vel viride."

[917] IOANNES BURIDANUS, *Quaestiones super De sensu et sensato*, q. 19, Parisiis 1516, f. 39rb: "Nunc restat dicendum de divisione earum per modum totius integralis in suas partes integrales, et potest imaginari triplex modus divisionis totius integralis in suas partes integrales. Primus modus valde communiter dictus, et significat idem totum dividi in suas partes quoad ipsum habere partes integrantes ipsum. Sic enim dicitur celum vel sol vel luna dividi in suas partes integrales absque hoc quod partes alique separentur ab invicem

Buridan's taxonomy is, at first glance, very different from the one that is usually present in Medieval Latin discussions of *minima sensibilia*. Nevertheless, once it is considered more closely, it becomes rather clear that it represents a creative synthesis of more "traditional" elements of previous commentaries. Indeed, the first of the three kinds of division *per accidens* of sensible qualities that Buridan individuates is basically the kind of division usually characterised, in most previous commentaries, as a (potentially infinite) division *secundum imaginationem* of a given whole in the (unequal) parts that compose it, and that are perceptible in act by contributing to the perception of the whole to which they belong. Correspondingly, the second and third type of division correspond to two different kinds of real separation of parts from a given sensible whole. With the former case, Buridan refers to the separation from a sensible whole of parts sufficiently great to resist to the corrupting action of the containing medium, so that they remain perceptible in act on their own. With the latter case, instead, Buridan has in mind the separation from a sensible whole of parts which are not sufficiently great to resist to the corrupting action of the containing medium, and that, therefore, although in a progressive way, lose both the accidental forms of their sensible quality and their substantial form. It is in this sense that Buridan can say that, according to this last kind of division, matter and form are separated in a given material substance.

Interestingly, however, in all three cases Buridan discusses both the "traditional" case of the division of sensible qualities according to the division of matter to which they are united (the kinds of division, therefore, pertaining to the issue of *minima sensibilia* properly understood) and a parallel case concerning the division of sensible qualities into their degrees. This latter case, while, in itself, still referring to the division *per se* of sensible qualities, does not concern anymore sensible qualities considered as abstract entities, but, rather, sensible qualities as concretely instantiated in a given material substance. In this sense, and only in this sense, it is possible to claim that the division of a sensible quality in its degrees can interact with the issue of *minima sensibilia*.

nisi solum secundum rationem [...]. Secundus modus divisionis est per realem separationem partis a parte cum permanentia partium quod amplius ex illis partibus non est aliquod unum. Tertius modus divisionis est per corruptionem unius partis alia remanente, et sic secundum Aristotelem divideretur compositum substantialem in materiam et formam, quia corrumpitur forma manente materia."

Buridan's text makes aboundantly clear this aspect. Starting with the first kind of division he has distinguished, namely, the one *secundum imaginationem*, indeed, he claims the following:

> The first conclusion is that a sensible passion, such as heat or coldness, is divisible or divided in infinite parts both concerning the graduated parts (*partes graduales*) without considering the division of the subject, and in quantitative parts (*partes quantitativas*) esisting one out of the other according to the extension of the subject, without considering the division according to degrees. And there is no need to prove this here, because both [parts of the conclusion] are sufficiently known from other places[918].

It is important to underline that both the ("traditional") division of sensible qualities *secundum imaginationem* in quantitative parts and the new one in "graduated parts (i.e., degrees of intensity)" are put on the same level by Buridan, insofar as both are (potentially) infinite, although of course they cannot be performed together. The reference to the case of heat and coldness, of course, serves Buridan's purpose in this respect, insofar as Buridan had already claimed that primary qualities are the paramount examples of qualities that are divisible in an infinity of degrees.

The second kind of division, again, confirms the parallel between the division of sensible qualities in quantitative and in "graduated" parts:

> The second conclusion is: a sensible passion is not divisible to infinity in the second way, i.e., concerning the real separation and the survival of parts, because in the same subject it is not possible to separate a degree [of a sensible quality] from a degree [of the same sensible quality] if not through corruption [of the first degree], nor is it possible to add a degree to a degree if not through generation, unless this happens through a supernatural power and in a miraculous way, of which Aristotle is not speaking here. Similarly, concerning the division according to the extension of a subject it is possible to reach a part of flesh or water so small that before that can be divided by a natural agent it is corrupted and it is resolved in the containing body. Therefore through a natural agent it is not possible to proceed to infinity according to such division. I concede, however, that it could according to a supernatural power and in a miraculous way. And in this sense can be expounded many authorities in

[918] IOANNES BURIDANUS, *Quaestiones super De sensu et sensato*, q. 19, Parisiis 1516, f. 39rb: "Prima conclusio est quod passio sensibilis ut caliditas vel frigiditas est in infinitas partes divisibilis vel divisa tam quantum ad partes graduales circumscribendo divisionem subiecti quam in partes quantitativas extra invicem existentes secundum extensionem subiecti circumscribendo divisionem secundum gradus. Et hoc non oportet hic probare, quia utrumque satis est notum ex aliis locis."

> which it is posited a *minimum* in natural bodies or in natural qualities, or even in which it is denied the divisibility to infinity of those bodies or passions[919].

Here Buridan denies both the (potential) infinite divisibility of sensible qualities according to the real separation of parts capable of resisting on their own to the corrupting action of the containing medium, and the corresponding (potential) infinite divisibility of sensible qualities according to the instantiation of their different degrees (as capable of persisting in existence). Buridan's reasoning here is that the generation of a new degree of a sensible quality (of heat, to keep the same example) in a given sensible whole requires the previous corruption of the degree which was instantiated in it. That is to say, at least according to the "admixture" theory to which Buridan subscribes (which comes extremely close, in this respect, to the succession of forms theory), no two degrees of the same sensible quality (barring any direct divine intervention) can be instantiated in the same sensible whole at the same time, even though the sensible quality considered is spatially extended over it according to the spatial extension of its matter.

The consideration of the third kind of division, finally, provides a further occasion to reinforce the parallel, although, here, one must regret Buridan's reticence to express himself in clear terms:

> The third conclusion [is] that a sensible passion is divisible to infinity gradually, because if from the highest degree of heat the lowest is reached in a continuous way in infinity according to division, the gradual parts are removed one after the other through their continuous and successive corruption[920].

As said, Buridan is very ellyptic in this passage. Indeed, when compared with the two previous conclusions, the third one only considers the case of the division of sensible

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[919] IOANNES BURIDANUS, *Quaestiones super De sensu et sensato*, q. 19, Parisiis 1516, f. 39rb-va: "Secunda conclusio est: passio sensibilis non est in infinitum divisibilis secundo modo, scilicet quantum ad separationem realem et remanentiam partium, quia in eodem subiecto non potest separari gradus a gradu nisi per corruptionem, nec apponi gradus gradui nisi per generationem, nisi hoc sit per potentiam supernaturalem et miraculose, de quo non intendit hic Aristoteles. Similiter de divisione secundum extensionem subiecti posset deveniri ad ita modicam partem carnis vel aque quod antequam posset enim divisa ab agente naturali ipsa esset corrupta et resoluta in corpus continens. Ideo per agens naturale non posset in infinitum procedi secundum talem divisionem. Concedo tamen quod posset secundum potentiam supernaturalem et miraculose. Et ad istum sensum possunt exponi multe auctoritates in quibus ponitur minimum in corporibus naturalibus vel in qualitatibus naturalibus, vel etiam in quibus negatur illorum corporum vel passionum in infinitum divisibilitas."

[920] IOANNES BURIDANUS, *Quaestiones super De sensu et sensato*, q. 19, Parisiis 1516, f. 39va: "Tertia conclusio quod passio sensibilis est in infinitum divisibilis gradualiter, quia si de calidissimo fiat frigidissimum continue in infinitum secundum divisionem, graduales partes auferuntur una post aliam per earum continuam et successivam corruptionem."

qualities according to degrees and not to quantitative extension. This is all the more unfortunate because this is the point where Buridan could have stated his belief in the existence (at least for a certain amount of time, during a progressive process of corruption) of a (potentially) infinite number of sensible qualities united to portions of matter too small to be perceptible in act. Nevertheless, what he says concerning the parallel case of division in degrees (affirming that it can be potentially infinite in this case) suggests that he is committed to a corresponding view for what concerns the division of qualities according to quantitative extension by a process of corruption, that is, to the fact that the number of parts of a sensible whole that can exist (for a certain time) endowed with their own sensible qualities without being perceptible in act is (potentially) infinite. More precisely, for what concerns the division in degrees, Buridan affirms that, again taking the case of heat and coldness, to go from the highest degree of heat to the lowest degree it is necessary the generation and successive corruption of the (potentially) infinite number of intermediate degrees, since, contrary to what happens with secondary qualities, it is not possible to move from a higher to a lower degree (and viceversa) without previously crossing all the intermediate ones between them.

All this extended comparison, which I have deemed worthy to discuss in some detail, and therefore the thorough insertion of the division of (concretely instantiated) sensible qualities in degrees within the domain of the division *per accidens* of sensible qualities, that is, the domain of their division according to the (potentially) infinite division of the matter to which they are united, is of paramount importance not only for the history of the Medieval Latin debate on *minima sensibilia*, but, far more broadly, for the history of the Medieval Latin overall understanding of the ontology of sensible qualities. Indeed, in Buridan's overall theoretical model any kind of division of a sensible quality, be it *per se* or *per accidens*, insofar as such quality is instantiated in a concrete material substance, presupposes that such quality is a continuous entity, rather than a discrete one. This, in the long run, might have contributed to reducing the ontological distinction between sensible qualities and the matter to which they are united in Scholastic Aristotelianism.

When one turns to the other version of Buridan's *Quaestiones* on the *De sensu*, while the fundamental aspects analysed until now are not put into question, the overall discussion is significantly different. All in all, the first thing to remark is that the "second"

version of Buridan's *Quaestiones*, which is preserved only in the form of students' *reportationes*, is much more reduced than the one of the Lokert edition. In it, indeed, Buridan does not even discuss the issue of the divisibility *per se* of sensible qualities, and, as a result, he does not even mention one of the two fundamental aspects which are discussed in the *Quaestiones* of the Lokert edition, namely, the division of sensible qualities into degrees. The same, however, is not true of the other fundamental aspect discussed in the Lokert edition, namely, the notion of *insensibilia propter parvitatem*, as I will show below. Before doing so, however, I will present the overall framework and the main steps of Buridan's discussion of *minima sensibilia* in this version of the *Quaestiones*.

Here, in q. 24, *Utrum paxiones sensibiles sint divisibiles in infinitum propter parvitatem*, Buridan starts his *determinatio* by distinguishing between the (finite) division of a continuous entity in equal parts and the (potentially infinite) division in unequal ones[921]. Still, he immediately comes closer to the text of the Lokert edition by adding a distinction within the case of the (potentially infinite) division of bodies in unequal parts, a distinction that contains, *in nuce*, all the three cases that compose the taxonomy of the division of material substances (and, *per accidens*, of the sensible qualities united to their matter) in the Lokert edition:

> However, it must be understood that this division to infinity [i.e., that of a body in unequal parts] can be imagined in two ways: in one way according to the real separation of a part from [another] part, in another way only according to reason. In the first way it is not true that every magnitude is divisible to infinity. The first case is [the one] concerning the heavens, because [in such case, due to the impassibility of the heavens] a part cannot be separated from [another] part. The second cases are [those] concerning generable and corruptible entities, because it is possible to reach such a smallness [in their division] that [this smallness] cannot resist to the containing [medium] without being corrupted [and resolved] into the containing

[921] IOANNES BURIDANUS, *Quaestiones altere super De sensu et sensato*, q. 24, ms. Milano, Biblioteca Ambrosiana, G. 71.Sup., ff. 73vb-74ra: "Prima est quod nullum corpus est divisibile in infinitum secundum partes equal[l]es unicte <parti> primo a<c>cepte. Item probo quod partes debent esse equal[l]es prime parti ac<c>epte, quia si loquemus de partibus <in>equalibus ad invicem, tunc potest concedi quod corpus est divisibile in partes ad invicem, quia pono casum quod primum corpus dividitur |f. 74ra| in duas medietates, et quelibet illarum in duas, et adhuc ille etc., tunc omnes ille medietates sunt equal[l]es. Et sic nam <corpus> potest dividi in infinitum, ergo aliquod corpus potest dividi in partes <inequales> in infinitum, et per consequens omne corpus divisibile in duas medietates est divisibile in infinitum, quia quelibet medietas potest dividi in medietates duas. Secunda conclusio est quod corpora naturalia sunt divisibilia in infinitum in partes non eiusdem quantitatis, sed eiusdem proportionis. Ista conclusio probata est sexto *Physicorum*" (note that the second version of Buridan's *Quaestiones* is always quoted according to the manuscript witness of the Ambrosiana library).

> [medium] immediately or in a short time. Therefore etc. But talking of the division according to imagination, so it would be said that all bodies are divisible to infinity[922].

The latter case discussed in the passage, namely, the one of division according to imagination (*secundum imaginationem*) substantially corresponds to the first one discussed in the Lokert edition. The former case discussed in the passage, instead, holds together the second and the third cases discussed in the Lokert edition, that is, respectively, the case of the real separation of a given material substance in parts that are capable of resisting to the corrupting action of the containing medium, and the case of the real separation of a given material substance in parts that are too small to resist to the corrupting action of the containing medium. A very important difference from the text of the Lokert edition, however, at least for the purposes of the hypothesis suggested in the present chapter (in connection with Chapter 2), is represented by the fact that in the text of this passage, contrary to what happens in the Lokert edition, Buridan explicitly states that the corruption of such extremely small portions of a material substance happens "immediately [...] or in a short time (*statim* [...] *vel brevi tempore*)". That is, this passage is the one, among those discussed in this chapter (but a corresponding one, as I will show below, can be found in Buridan's *Expositio* on the *De sensu*), which states in the most explicit terms, in the context of the debate on *minima sensibilia*, a commentator's adherence to a temporally extended conception of substantial change. True, Buridan uses a form of caution by including this case as part of a disjunction, suggesting that the corruption of such portions of material substances could also take place instantaneously. Nevertheless, given Buridan's overall position on *minima sensibilia*, both in the *Quaestiones* of the Lokert edition and in this other version, it seems really hard to claim that this is anything more than a rhetorical device to make more acceptable to the audience what was still, evidently, an innovative theoretical proposal.

[922] IOANNES BURIDANUS, *Quaestiones altere super De sensu et sensato*, q. 24, ms. Milano, Biblioteca Ambrosiana, G.71.Sup., f. 74ra: "Tamen sciendum quod ista divisio in infinitum potest dupliciter ymaginari: uno modo secundum realem separationem partis a parte, alio modo secundum rationem solum. Primo modo non est verum quod omnis magnitudo sit divisibilis in infinitum. Primo est instancia de celo, quia pars non potest separari a parte. Secunde instancie sunt de generabilibus et corruptibilibus, quia ad tantam parvitatem possit deveniri quod non possit resistere continenti quin statim corrumpantur in continens vel in brevi tempore. Ergo etc. Sed loquendo de divisione secundum ymaginationem, sic diceretur quod omnia corpora sunt divisibilia in infinitum."

After this passage, Buridan states, again in accordance with what he claims in the Lokert edition, that these three kinds of quantitative division of a material substance correspond to the three kinds of quantitative division *per accidens* of sensible qualities. Nevertheless, he adds an extremely important distinction, one that makes the passage worth quoting in full:

> But seen about the division of a body, in the same way it must be said concerning the division of sensible passions. However, it is necessary to understand these passions in two ways: in one way according to this, [i.e., the fact] that they exist in themselves (*absolute*), in another way in relation to the sense. If [they are considered] in the first way, so it must be said that they are divided to infinity in the same way as [their] subjects <are [so] divided>, and so their division is determined according to the division of their subjects. If, however, they were considered in relation to the sense, it would appear that to ask whether sensible passions are divisible to infinity is nothing else than asking whether it is possible to posit a sensible passion so small that a smaller one [than it] cannot be perceived[923].

Buridan here makes explicit another aspect that is also present (albeit in an implicit way) in the text of the Lokert edition, and that would also remain present in the *De sensu* commentary attributed to Oresme and to Albert of Saxony. In particular, Buridan claims that there is a fundamental distinction between what could be called the ontology and the epistemology of the issue of the divisibility *per accidens* of sensible qualities, that is, between the analysis of the way in which sensible qualities can exist on their own together with the portions of matter to which they are united, and the analysis of whether or not they are able, while existing in a given condition, to act on the external senses so as to engender a sensation.

When considering, specifically, the case of *insensibilia propter parvitatem* (so of "permanent" sensible qualities existing on their own that are not perceptible in act), Buridan's position in the text of the second version is, in both these respects, fundamentally in agreement with the position presented in the text of the Lokert edition. Indeed, Buridan clearly believes that no portion of matter existing on its own in a

[923] IOANNES BURIDANUS, *Quaestiones altere super De sensu et sensato*, q. 24, ms. Milano, Biblioteca Ambrosiana, G.71.Sup., f. 74ra: "Sed vis[s]o de divisione corporis, eodem modo dicendum est de divisione passionum sensibilium. Tamen oportet dupliciter intelligere istas passiones: uno modo secundum id quod sunt absolute, alio modo in relatione ad sensum. Si primo modo, ita dicendum quod dividuntur in infinitum sicud <dividuntur> subiecti, et ita determinata est divisio eorum sicud <divisio> suorum subiectorum. Si vero considerentur in relatione ad sensum, sic videretur quod querere utrum passiones sensibiles sint divisibiles in infinitum non est aliud quam querere utrum sit dare ita parvam passionem sensibilem quod minor non possit sentiri."

"permanent" way endowed with its own sensible qualities can *always* be imperceptible in act due to its smallness. Buridan's full discussion in the text of the second version is the following one:

> And concerning this question Aristotle says sufficiently that the fact that passions are made insensible can be understood in two ways: in one way that the same [i.e., passion] cannot be perceived [when existing] on its own distinct [from the whole to which it belongs], in another way that it cannot be perceived anymore neither by itself nor together with other [passions]. In the first way passions are made insensible due to [their] smallness, and this is evident to the sense, because you experience that there is a magnitude so small and you do not experience whether [it is] hot or cold, hard or soft. And if this is true of the sense of touch, it is necessary that it is so true of any other sense, because assuming that when a sensory power is stronger and better disposed in perceiving, so much more can it perceive a smaller sensible. However, I suppose that no sense exceeds a determined power to infinity. But if this is so, it will follow that no sense can perceive a magnitude greater than [all] others in infinity. Another conclusion is that no passion is insensible due to [its] smallness which can never be perceived, either by itself or with other [passions], because if some [passion] were such that it cannot be perceived with other [passions], it would follow that then a magnitude could not modify the sense. The consequence is false. The consequence appears because such magnitudes could be divided in parts so small as this one. Moreover, if then some <magnitude> were insensible due to [its] smallness, it would follow that no sensible is perceived, if not of a part of a certain quantity. The consequence is false, because what is said according to a part alone is not said *per se* and in the first place, but only that which is said according to the whole. The consequence is evident, because I take a magnitude that you say is perceived together as a whole by itself. First, from it let us take such a small part such as that which you say cannot be perceived, and if it is so, it will follow that that part is not perceived, and if it is not perceived, therefore the remaining [parts] are not perceived[924].

[924] IOANNES BURIDANUS, *Quaestiones altere super De sensu et sensato*, q. 24, ms. Milano, Biblioteca Ambrosiana, G.71.Sup., f. 74ra: "Et de ista questio Aristoteles dicit sufficienter quod paxionem reddi insensibilem potest intelligi dupliciter: uno modo quod ipsa seorsum distincta non potest (*ms*. possint) sentiri, alio modo quod non potest (*ms*. possunt) amplius sentiri nec per se nec cum alio. Primo modo paxiones redduntur insensibiles propter parvitatem, et hoc est manifestum ad sensum, quia tu experis (*ms.* expiris) esse ita parvam magnitudinem et non experis (*ms.* expiris) utrum calida vel frigida, dura vel mollis (*ms.* molis). Et si hoc verum est de tactu oportet quod sit ita verum de quolibet alio sensu, quia supposito quod quanto virtus sensitiva est fortior et melius disposita in senciendum, tanto magis potest percipere minus sensibile; modo suppono quod nullus sensus excedit determinatam virtutem in infinitum. Sed si ita est, sequitur quod nullus sensus potest percipere maiorem magnitudinem quam altera in infinitum. Alia conclusio est quod nulla paxio est ita insensibilis propter parvitatem quod nunquam possit sentiri, vel per se vel cum alio, quia si aliqua talis es<se>t qui non possit cum alio sentiri, sequeretur quod tunc magnitudo non possit sensum immutari. Consequens est falsum. Consequentia patet quia tal[l]es magnitudines possunt (*ms*. possint) dividi in ita parvas partes sicud est ista. Item, si tunc aliqua <magnitudo> sit insensibilis, sequeretur quod nullum sensibile sentiretur nisi tante partis. Consequens est falsum, quia quod dicitur secundum partem solum non dicitur per se et primo, sed solum illud quod dicitur secundum se totum. Consequentia patet, quia accipio magnitudinem quam dicis sentiri simul secundum se totam per se. Primo de illa accipiamur ita parvam partem sicud illa quam dicis non posse sentiri, et si ita est, sequitur quod illa pars non sentietur, et si non sentietur, ergo nec relique sentientur."

The passage is fundamental, in that it restates in very clear terms Buridan's belief in the existence on their own, in the actual world, of "permanent" sensible qualities that are not perceptible in act, i.e., those associated with material substances (or portions thereof) existing between their threshold of perceptibility and their threshold of corruptibility. The passage, moreover, presents important elements in commno both with Jandun's discussion and with Burley's one.

From Jandun's dichotomy between what is *insensibile* and what is *insensibile omnibus modis* comes the idea that something can be *insensibile* on its own, but not so that it cannot become *sensibile* (albeit only in an "indistinct" way[925]), by uniting with a sufficiently great quantity of parts existing under the same condition. Moreover, even here, as in the text of the Lokert edition (and in agreement with Jandun), Buridan uses, in order to argue for this conclusion, the third meaning of potentially perceptible, by interpreting it as I have detailed above.

Still, the distinction between the two kinds of "imperceptibility" rejoins, *e contrario*, Burley's analogous distinction between the two ways in which something can be said to be *sensibile* (whereas Jandun's more elaborate position on the issue is absent from Buridan's discussion). Another aspect of the passage that suggests a connection with Burley's discussion is the appeal to the mereological principle according to which what is true of the whole is not necessarily true of its parts, although the principle is here used to justify, more specifically, the idea[926] that a sensible quality that is perceptible in act can be composed of parts that are not perceptible in act on their own (not only, and not specifically, those coming to exist during the process of corruption, evidenty, but rather those that have a sufficient power to resist on their own to the corrupting action of the containing medium).

When one looks at the text of Buridan's *Expositio*, there is not much to add to the overall framework that I have presented so far. Indeed, the text is extremely close to the Aristotelian one, and mostly aimed at clarifying it. Therefore, Buridan does not specifically discuss, in the *Expositio*, any of his distinctive concerns when dealing with *minima sensibilia* in the *Quaestiones*, namely, the notion of *insensibilia propter*

[925] Even though Buridan does not make reference to this concept in the passage just quoted or anywhere else in the text of the other version of the *Quaestiones*.
[926] Again, linked with a "corpuscularian" understanding of the mereological structure and of the production of sensible qualities that are perceptible in act.

parvitatem and the issue of the division of a sensible quality in degrees. Nevertheless, there is at least one aspect that must be mentioned in the context of this chapter, since it provides further support to the idea that Buridan adopts, in his discussion of *minima sensibilia*, a "piecemeal" conception of substantial change. Indeed, while expounding the text of *De sensu* 6, 446a6-7, Buridan claims the following:

> It follows "Separated, however". Here [Aristotle] solves a doubt concerning the parts separated [from the sensible whole to which they belong], and firstly on the part of the passion, secondly on the part of the sense in "Even if". Firstly, [Aristotle] wants to say that it does not happen that sensible passions are divided to infinity so that they can remain perceptible on their own, not even for a certain time. On the contrary, we can reach a quantity so small that immediately that quality [i.e., the one united to that quantity of matter] is corrupted by the containing medium, such as if a sweet flavour extremely small were poured into the sea it would be corrupted immediately or very quickly (*statim vel valde cito*)[927].

Here again, as in the corresponding passage from the second version of the *Quaestiones*, the "piecemeal" conception of substantial change is presented in very explicit terms alongside its more "traditional" view involving the instantaneous corruption of the substance being corrupted. Nevertheless, here again, as in the text of the second version of the *Quaestiones*, there is no reason to suppose that this is more than a rhetorical device.

This said, the *Expositio* is important in that it clearly reaffirms Buridan's belief, as already evidenced thanks to both versions of the *Quaestiones*, that no "permanent" sensible quality is *always* imperceptible in act, since it can become so perceptible by becoming part of a larger aggregate of entities endowed with the same sensible qualities:

> It follows "That, certainly". Here [Aristotle] riepilogates saying that it appears from what has been posited that there are some magnitudes which escape us due to [their] smallness, so that we cannot see them distinctly (*distincte*), still no [magnitudes] escape us due to [their] smallness so that they cannot be perceived united to other [magnitudes][928].

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[927] IOANNES BURIDANUS, *Expositio in De sensu et sensato*, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2162, ff. 147vb-148ra (although the text is quoted according to the Vatican manuscript, it has been fully collationated with the text of the Erfurt manuscript): "Sequitur *separate autem*. Hic solvit dubium quantum ad partes separatas et primo ex parte passionis, secundo ex parte sensus in *quin immo*. Primo vult dicere quod non contingit passiones sensibiles in infinitum dividi ita quod possint seorsum manere, saltem aliquo tempore, notabiles. Ymmo possumus ad ita parvam quantitatem devenire quod statim corrumpitur illa qualitas a continente, ut si valde parva dulcedo permiscetur mari statim vel valde cito corrumperetur."

[928] IOANNES BURIDANUS, *Expositio in De sensu et sensato*, ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2162, f. 148ra: "Sequitur *Quod quidem*. Hic recapitulat dicendum quod ex positis patet

Here it is noteworthy that Buridan makes, again, appeal to the notion of a "distinct", as opposed to an "indistinct", vision, a notion which therefore plays a key role in his argument concerning the conditions of perceptibility of *insensibilia propter parvitatem* and the "corpuscularian" model on which they are grounded. Unfortunately, here as in both versions of the *Quaestiones*, such a model is not developed any further.

4.4.2.2. John Buridan's Doctrine of *Minima sensibilia*: A Summary

Given the extent, originality and importance of Buridan's discussion of *minima sensibilia*, it might be important, at this point, to try to summarise in some detail the main conclusions that I have reached throughout its analysis. The first important aspect to remark is certainly that Buridan's position is rather consistent throughout all the versions of his *De sensu* commentaries. This is in itself a significant finding, given that, as I have suggested above, it appears from manuscript evidence that at least the two versions of the *Quaestiones* belong to very different periods in Buridan's teaching activity (the version of the Lokert edition being datable before 1343 and the version of the Ambrosiana manuscript being datable in or around 1359), whereas it seems likely that the *Expositio*, as it is the case for Buridan's commentaries to many other of Aristotle's *libri naturales*, pre-dates both.

Two elements of this position, as I have argued, stand out for their importance. The first one is the fact that Buridan is presumably the first *De sensu* commentator to take for granted in such explicit terms, following Jandun's lead (but also substantially in agreement with what Burley claims in the *Quaestiones*), the existence in the actual world of what he calls *insensibilia propter parvitatem*, namely, a class of extremely small portions of matter endowed with their own sensible qualities that are not perceptible in act on their own and that, what is more, have a "permanent" existence, insofar as they are below the threshold of their perceptibility but above that of their corruptibility by the containing medium. This class of entities, as Buridan remarks throughout all of his *De sensu* commentaries, can always become perceptible by uniting to larger wholes formed

quod alique sunt magnitudines latentes nos propter parvitatem sic quod non possumus eas videre distincte, tamen nulle sic latent propter parvitatem quin coniuncte cum aliis possint sentiri."

by portions of material substances endowed with the same sensible qualities. It is exactly to explain how this process unfolds that Buridan further articulates Jandun's "corpuscularian" model of the production and the mereological structure of sensible qualities, resorting, among others, to the notion of the 'distinctiveness' of perception: when, indeed, we perceive the sensible quality formed by a certain number of *insensibilia propter parvitatem*, we perceive only the whole distinctly (*distincte*), yet none of its component parts. Still, it remains true for Buridan, as for Burley (but differently from Jandun), that, below the threshold of corruptibility of material substances (or portions thereof) there exist an entire class of "ephemeral" sensible qualities that are not perceptible in act on their own which come to exist for a very short span of time throughout the process of corruption of the entities in which they inhere.

What, therefore, can be ascertained is that, as Burley, but in a much more explicit way, Buridan is committed to the existence in the actual world of two kinds of sensible qualities that are not perceptible in act on their own.

On the one hand there are those portions of a material substance (or material substances themselves) which are within the size-range between the threshold of their perceptibility and that of their corruptibility, whose sensible qualities exist in act on their own without ever becoming perceptible in act, unless they unite with other portions of material substances (or material substances themselves) endowed with the same sensible qualities so as to form a larger aggregate. These sensible qualities (or, better, the entities to which they belong), to which Jandun for the first time had given a name, that of *insensibilia*, are what Buridan calls *insensibilia propter parvitatem*.

On the other hand, even below the threshold of corruptibility of material substances or of portions thereof, all the sensible qualities associated with (at the limit) potentially infinitely small portions of matter come to exist for a very short span of time during the temporally extended process of their corruption.

The second important aspect of Buridan's discussion of *minima sensibilia* is, instead, an entirely original one. Indeed, Buridan appears to be the first *De sensu* commentator among those discussed in this chapter and in the previous one to explicitly insert, within the debate on *minima sensibilia* (although, more precisely, within the debate on the division *per se* of sensible qualities in species within genera, even though this is later put in connection with the division *per accidens* of sensible qualities) a reference to

the division of sensible qualities into (quantitatively measurable) degrees of intensity, that is, a reference to the issue of the *intensio* and *remissio* of accidental forms. Although this aspect only features explicitly in the version of the *Quaestiones* of the Lokert edition, its insertion into the debate on *minima sensibilia* (more precisely, of the *numerus sensibilium*) is an interesting innovation, one that, as I will show below, will be followed in the commentary attributed to Nicole Oresme and to Albert of Saxony. The way followed by Buridan to integrate two apparently distinct debates is simple, yet ingenuous: Buridan equates the degrees of sensible qualities with species. That is to say, in Buridan's reasoning, at least in the case of the four primary qualities, the proper sensibles of the sense of touch, each degree is a different species (the situation is apparently different, according to Buridan, for secondary qualities, where intermediate species, insofar as they are not formed by the admixture of their extremes, cannot easily be reduced to degrees). This original interpretation has two important consequences. The first one is that Buridan is thus able, contrary to Aristotle's own statement in the text of *De sensu* 6, to claim that, at least for the four primary qualities, there is a (potentially) infinite number of species (that is, of degrees) between the two extremes. The second one, which derives from the first one, is that Buridan is thus able to find a way to insert continuity into the very structure of sensible qualities, not only as concretely instantiated in material substances, but also once considered on their own, in abstraction from matter. This is a fundamental development for the overall understanding of sensible qualities in the Scholastic world, one, however, whose consequences I cannot retrace here. Indeed, in Buridan's model it is not only the case that sensible qualities (at least primary ones) inhering in material substances can acquire different degrees which are, at least in principle, subject to quantitative measurement. More than that, such degrees, insofar as they are considered as species, make it so that the only way to conceive (primary) sensible qualities is as entities endowed with a quantitatively measurable structure, insofar as degrees are "elevated" by Buridan to the role of species (the only intermediate ones, to be precise) of such sensible qualities.

4.4.3. A Commentary Attributed to Nicole Oresme and Albert of Saxony on *Minima sensibilia*

4.4.3.1. On the Threshold of a New Phase in the Medieval Latin Debate on *Minima sensibilia*

The last commentary to be discussed in this chapter is the *De sensu* commentary which has been attributed both to Nicole Oresme and to Albert of Saxony. The commentary is extant in three manuscript witnesses, namely, ms. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 4° 299 (end of the 14th century), ff. 128r-157v (where the text is transmitted anonymously, but that Amplonius Ratinck de Bercka, in the famous catalogue of the manuscripts he possessed, attributes to Nicole Oresme), ms. München, Bayerische Staatsbibliothek, Clm 761 (14th century for the ff. 1-12r, 1378 for the ff. 12r-47v, 1366 for the ff. 49r-85r), ff. 41r-47v (where the text is also transmitted anonymously) and, finally, ms. München, Bayerische Staatsbibliothek, Clm 4376 (1365-1367), ff. 68r-85v (where the text is attributed to Albert of Saxony).

The text has been critically edited in 1983 by Jole Agrimi[929], who has not ventured any hypothesis concerning the attribution of the text (or even its precise chronology), but who has, nonetheless, provided important elements to discuss the issue. It. seems therefore important to summarise here the results of Agrimi's discussion[930]. Agrimi starts by noting that only the Clm 4376, the manuscript chronologically closer to the writing of the commentary, presents an explicit attribution, namely, one to Albert of Saxony, whereas the attribution to Oresme of the text of the Erfurt manuscript certainly bears less weight, insofar as it is only found in Amplonius de Bercka's much later inventory, an inventory that, moreover, as it is well known, is frequently imprecise in its attributions. Nevertheless, a closer look at the attribution of the Clm 4376 introduces two problems. The first one is that the attribution is only contained in the *colophon* that follows q. 22 of the commentary (*Utrum pulsus in iuvenibus sit fortior quam in hominibus senibus*),

[929] Cf. J. AGRIMI, *Le* Quaestiones de sensu *attribuite a Oresme e Alberto di Sassonia (Pubblicazioni della Facoltà di lettere e filosofia dell'Universita di Pavia)*, Firenze, La Nuova Italia, 1983. A list of *quaestiones* of the whole commentary, based on Agrimi's edition, is provided in EBBESEN, THOMSEN THÖRNQVIST, DECAIX, "Questions on *De sensu et sensato, De memoria* and *De somno et vigilia*. A Catalogue", *op. cit.*, p. 84.
[930] Cf. AGRIMI, *Le* Quaestiones de sensu *attribute a Oresme e Alberto di Sassonia*, *op. cit*., pp. 29-34.

which, however, is not a *quaestio* on the *De sensu*, but rather refers to the fourth chapter of the *De morte et vita* (480a9-10). More than that, the formulation used in the *colophon* is rather ambiguous: indeed, the text says *collecte* [i.e., the *Quaestiones*] *Parisius per [...] Albertum de Rychmersdorf*. As Agrimi notes, however, the term *collecte* might not indicate a paternity of the *Quaestiones*, but rather the fact that the text is based on Albert's notes concerning someone else's teaching. When one turns, then, to the contents of the commentary to try to find some more hints concerning the attribution of the text, especially comparing it with known works of both Oresme and Albert, the situation does not change significantly. It is certainly relevant that, throughout the commentary, the species of sensible qualities existing in the medium and in the sense organ (and, indeed, sensible qualities themselves) possess a much higher degree of ontological consistency than Oresme's theory of sensible qualities as *modi rerum* would allow to admit (if anything, the overall ontological characterisation of sensible qualities provided in the commentary is much closer to Buridan's one). Nevertheless, this very same theory was condemned in 1347, and it might well be possible, at the present state of research, to date the commentary after 1347 (indeed, certain formal and contenutistic features of the commentary make it likely to claim that it belongs to the second half of the 14th century, as I will briefly mention below). Other issues do not allow to draw more definitive conclusions; quite the contrary. Indeed, the overall discussion of vision in the commentary has close affinities with both Oresme's and Albert's known theories, and the explanation of the so-called 'phenomenon of Antipheron' (i.e., the phenomenon by which someone sees his own image reflected in the air in front of him[931]) is different from both Albert's and Oresme's ones, and rather close to the one adopted by Thaemo Judeaus in his *Questiones* on the *Meteorologica* (cf. q. III.10). Concerning, then, the issue of the instantaneity of the propagation of light, whereas the commentary shows some similtarities with Oresme (cf. *Quaestiones super geometriam Euclidis*, q. 17; *Quaestiones in De anima*, q. II.17, *Quaestiones in Physicam*, q. I.20, qq. V.1-2; *Livre de Ethiques*, q. X.5), there are also passages close to Albert's *De caelo* commentary (cf. q. I.14 and q. II.23), to his *Physics* commentary (q. IV.9) and to his *Meteorologica* commentary (q. III.2). Interestingly, as Agrimi notes, also in this case Buridan's influence appears to be the strongest one. The same difficulties (and the same basic scheme) can also be found

[931] Cf. Aristotle, *Meteorologica* III.4, 373b1-10.

for what concerns the commentary's discussion of the problem of the permanence of the elements in mixtures and, Agrimi claims, also in the case of the overall understanding of *minima* in the commentary. I will show below in what sense, however, the position on *minima sensibilia* in the commentary presents important differences not only from Buridan's position on *minima sensibilia*, but also from Oresme's (and Albert's) positions on *minima naturalia*.

This said, the most important aspect of Agrimi's analysis is certainly the fact that it allows to see the extremely close links that the text bears to commentaries safely attributed to both Oresme and Albert and also to Buridan himself, therefore clearly allowing us to consider it a typical product of the teaching at the Parisian Faculty of Arts around the half of the 14th century.

Interestingly, however, as I have already anticipated, this characterisation is not entirely true for what concerns the discussion of the issue of *minima sensibilia* in the commentary, an issue which is dealt with in q. 17, *Utrum qualitates sensibiles sint in infinitum divisibiles*. Buridan's influence (in the verson of the *Quaestiones* printed in the Lokert edition) is certainly evident in the overall taxonomy of the kinds of division of sensible qualities, which makes room (as a "third" kind of division between the division *per se* in species within genera and the division *per accidens* according to the quantitative division of matter) to the division of sensible qualities into degrees:

> Fourthly, it must be known that [the claim] that sensible qualities are divisible to infinity is understood in three ways: in the first way [as meaning] that they are divided to infinity in subjective parts or species, such as that a colour is divided not in a certain number of species than not in more [i.e., in the overall number of its species]; similarly also flavour. In the second way [as meaning] that it can be divided to infinity in graduated parts (*in partes graduales*). In the third way in quantitative parts (*in partes quantitativas*). And, moreover, [in this last case] in two ways: or [as meaning] that [sensible qualities] are divisible to infinity by themselves and in an absolute way, without relating them to the sense, not considering whether they are perceived or not; in the second way in relation to the sense, i.e., [as meaning] that they are perceived or are not perceived[932].

[932] NICOLAUS ORESME sive ALBERTUS DE SAXONIA, *Quaestiones super De sensu et sensato*, q. 17, ed. AGRIMI, p. 201 (note that here and in the following quoatations from Agrimi's edition I have slightly modified the punctuation): "Quarto, sciendum quod in infinitum qualitates sensibiles esse divisibiles intelligitur tripliciter; primo modo quod in infinitum dividantur in partes subiectivas vel species, sicud quod color dividatur non in tot species quin in plures; similiter et sapor. Secundo modo quod in infinitum possit dividi in partes graduales. Tertio modo in partes quantitativas. Et iterum dupliciter: vel quod in infinitum sic essent divisibiles secundum se et absolute, non comparando eas ad sensum, non curando utrum sentiantur vel non; secundo modo in comparatione ad sensum, scilicet quod sentiantur vel non sentiantur."

Buridan's influence is also evident from the way in which the unidentified commentator discusses the first kind of division of sensible qualities, namely, the traditional Aristotelian division of genera of sensible qualities into their species. Indeed, while reaffirming the conclusion that there is always a finite number of species within any genus whatsoever of sensible qualities, he limits, exactly as done by Buridan, the validity of the argument presented by Aristotle in support of the finite nature of such division[933].

With respect to the division of sensible qualities into degrees, however, the commentator provides a more superficial discussion than (and partially different from) the one provided by Buridan. Indeed, the commentator limits himself to claim that:

> But if any degree whatsoever newly acquired or lost made a difference in terms of species, then consequently it would be said that the species of sensible qualities are infinite[934].

The commentator shares Buridan's view that the degrees of a sensible quality (as concretely instantiated in a given material substance) are infinite, but he abolishes any distinction between the case of primary qualities (where such degrees are, at least on Buridan's preferred interpretation, different species of these same qualities), and that of secondary qualities (where, according to Buridan, not every degree corresponds to a different species, since intermediate species of secondary sensible qualities are not generated by the admixture of their extremes)[935]. On the commentator's interpretation, moreover, whether the infinite degrees of sensible qualities are different species or not

[933] NICOLAUS ORESME sive ALBERTUS DE SAXONIA, *Quaestiones super De sensu et sensato*, q. 17, ed. AGRIMI, pp. 201-202: "Sed contra probationem conclusionis [i.e., that sensible qualities are only divisible into a finite number of species within any given genus] arguitur, quia inter duo puncta extrema unius linee infinita sunt puncta media, igitur etc. Responditur quod non est simile de punctis et speciebus qualitatum sensibilium, quia punta sunt eiusdem rationis et non excedunt se in perfectione, sedi ste species sunt alicuius certe perfectionis."

[934] NICOLAUS ORESME sive ALBERTUS DE SAXONIA, *Quaestiones super De sensu et sensato*, q. 17, ed. AGRIMI, p. 201: "Sed si quilibet gradus de novo acquisitus diversificaret speciem vel deperditus, tunc consequenter diceretur quod species qualitatum sensibilium essent infinite."

[935] Still, the commentator shares Buridan's view that the generation of the intermediate degrees of secondary qualities requires the action of primary qualities: "Secundo notandum est quod qualitates sensibiles sunt qualitates de tertia specie, et ideo Philosophus sepe in isto libro vocat eas passiones, quarum alique sunt prime sicud calidum, frigidum, humidum et siccum, que sunt obiectum tactus; alie secunde, que causantur a primis et sunt odor, qui est proprium obiectum olfactus, et sapor qui est obiectum gustus, color visus et sonus auditus. Tamen principaliter ad generationem odoris, saporis et colorum concurrunt prime qualitates, licet non sic ad generationem soni" (NICOLAUS ORESME sive ALBERTUS DE SAXONIA, *Quaestiones super De sensu et sensato*, q. 17, ed. AGRIMI, p. 200).

remains uncertain. Not only does he avoid taking a position on the issue, but the whole debate concerning the division of sensible qualities into degrees is left aside after this brief remark, showing, probably, that such a concern is largely extraneous to the commentator's overall intellectual framework and its insertion into the *quaestio* is, likely, just the result of Buridan's influence.

The full difference of the commentator's position from Buridan's one (and also from the known positions of Oresme and Albert as they can be reconstructed especially from their *Physics* commentaries) emerges, however, when discussing the third kind of division of sensible qualities, that is, the issue of *minima sensibilia* proper (and, first and foremost, the issue of *minima sensibilia* considered *absolute*, that is, not in relation to the sense, another distinction that the commentator seems to be taking, in particular, from the second version of Buridan's *Quaestiones*). The first thing to notice in this respect is that the commentator, contrary to Buridan, Oresme and also Albert, seems to be discussing the issue entirely outside of the conceptual framework of the "piecemeal" view of substantial change.

For what concerns *minima sensibilia*, the decision to renounce to the "piecemeal" view of substantial change means that the commentator has to revert, mostly, to a more "traditional" framework, namely, the one according to which the corrupting action of the containing medium on extremely small portions of matter existing on their own (and on their sensible qualities) is instantaneous[936], and the infinite divisibility *per accidens* of

[936] NICOLAUS ORESME sive ALBERTUS DE SAXONIA, *Quaestiones super De sensu et sensato*, q. 17, ed. AGRIMI, p. 202: "Secunda conclusio Philosophi quod qualitates sensibile sumpte secundum se, non in comparatione quod percipiantur a sensu, non sunt in infinitum divisibiles secundum partes quantitativas seorsum a toto existentes; probatur per rationem quartam ante oppositum, et est ratio Philosophi; et confirmatur quia, si taliter in infinitum dividantur, dividentur in aliquid tam parve virtutis et resistentie quod illa virtus non poterit resistere continenti sed statim corrumperetur, sicud minimus sapor infusus mari, ut dictum est in textu, quia maior virtus est in maiori corpore et in minori minor, et secundum quod corpus sensibile dividitur, secundum hoc debilitatur eius virtus et tandem devenitur ad quantitatem que convertetur in naturam continentis, quia non poterit resistere." Note that the acceptance, by the commentator, of an instantaneous view of substantial change could provide a further argument against the attribution of the commentary to Oresme: indeed, as I have shown in the second chapter, starting at least with his *Physics* commentary (which, however, is a rather early work, since it is presumably to be dated before 1347) Oresme clearly adopts the "piecemeal" view of substantial change, therefore explicitly rejecting an instantaneous view of the substantial change of any tridimensionally extended portion of a material substance. This same consideration, however, does not necessarily provide an argument against an attribution of the commentary to Albert, whose position on the temporal structure of substantial change is far more ambiguous in his *Physics* commentary, as I have briefly recalled in Chapter 2.

sensible qualities is therefore denied in the actual world, but to be debated in a possible world without the corrupting action of the containing medium[937].

The commentator clearly believes that, in this case, sensible qualities would be (potentially) infinitely divisible *per accidens* according to the division of the matter to which they are united, but not perceptible in act (below a certain threshold of smallness of matter itself):

> Concerning which [i.e., the possible world without the corrupting action of the containing medium] I posit the third conclusion that [sensible qualities would be] so [i.e., potentially infinitely divisible], but not any part taken away [from the sensible whole to which it belongs] by itself moves the sense, because then the sense would be susceptible to infinite augmentation[938].

The commentator here has recourse to one of the arguments presented by Aristotle at the beginning of *De sensu* 6 against the idea that sensible qualities are (potentially) infinitely divisible *per accidens*, employing it, however, to support the idea that, although sensible qualities (without the corrupting action of the containing medium) would be (potentially) infinitely divisible *per accidens*, they would not be perceptible in act below a certain threshold of smallness. This is interesting, since, in what follows, he presents a series of arguments against the conclusion that he has established, and the most important ones of them are explicitly recognised as the two ones (broken in three separate arguments by the commentator) used by Aristotle at the beginning of *De sensu* 6 in favour of the (potential) infinite divisibility *per accidens* of sensible qualities. Nevertheless, here they are used against the idea that, even in a possible world without the corrupting action of the containing medium, sensible qualities could exist on their own without being perceptible in act, and therefore against the idea that they would be divisible *per accidens* below their threshold of perceptibility:

> But against the conclusion it is argued [...]. Secondly, if not so [i.e., if sensible qualities were not always perceptible in actuality when existing on their own] it would follow that there would be some magnitude that cannot be known by us in any

[937] NICOLAUS ORESME sive ALBERTUS DE SAXONIA, *Quaestiones super De sensu et sensato*, q. 17, ed. AGRIMI, p. 202: "Sed dubitatur: si nullum esset corpus corrumpens, utrum sensibile potest in infinitum dividi."

[938] NICOLAUS ORESME sive ALBERTUS DE SAXONIA, *Quaestiones super De sensu et sensato*, q. 17, ed. AGRIMI, p. 202: "Pro quo pono tertiam conclusionem quod sic, sed non quelibet pars excepta per se movet sensum, quia tunc sensus esset augmentabilis in infinitum."

> way, which is false; the consequence stands, because bodies can be divided in such that they would not have their sensible qualities beyond [those dimensions]; therefore [smaller portions of them] would not be sensible through the sense, neither, as a consequence, through the intellect, insofar as the intellect does not cognise by itself inferior [i.e., material] things if not through the sense. Thirdly, if not so, it would follow that the sensible would be composed of non-sensible entities, which is false; the consequence stands because dividing a body in which sensible qualities exist, unless the qualities [more precisely, their power to act on the senses] were infinitely divisible, it would be reached [by division] some part that does not have a quality, and [that] as a consequence will not be sensible; and if it were not reached some part that does not have a quality, then [the sensible body] would be further divisible, and so the process of division will be to infinity, and it will be had [a conclusion] against the conclusion; or there will be a stop [in the process of division] and it will be had [a conclusion] against the consequent. Fourthly, then the sensible would be insensible; the consequent [of the preceding argument] implies [this]; the consequence is proved, because in such division either indivisible parts would be eventually reached, or one would continuously proceed further in division; if the first [case] is given, then that part [the last one in which the sensible body is divided] will be insensible, because an indivisible is not perceived, and as a consequence that indivisible quality would be insensible. Neither can the second [case] be given, because then it will be obtained the proposed [i.e., that, in the absence of the corrupting action of the containing medium, a sensible body would be potentially infinitely divisible]; and Aristotle uses these last three arguments in the text[939].

The first argument presented by the commentator is the second (epistmeological) one discussed by Aristotle in favour of the potential infinite divisibility of sensible qualities, whereas the second one is the first (ontological) one. The third argument presented by the commentator, instead, is explicitly recognised as an implication of this ontological argument, namely the fact that, if a sensible entity would be ultimately composed of insensible parts (interpreted, here, as parts that are not perceptible in act), then the whole composed of them would be insensible (i.e., not perceptible in act), which is clearly false.

[939] NICOLAUS ORESME sive ALBERTUS DE SAXONIA, *Quaestiones super De sensu et sensato*, q. 17, ed. AGRIMI, pp. 202-203: "Sed contra conclusionem arguitur [...]. Secundo, nisi sic sequeretur quod esset aliqua magnitudo que a nobis nullo modo posset cognosci, quod est falsum; consequentia tenet, quia in tantum possunt dividi corpora, quod non amplius haberent qualitates sensibiles; igitur non essent sensibilia per sensum nec per consequens per intellectum, eo quod intellectus non cognoscit de se inferiora nisi mediante sensu. Tertio, nisi sic sequeretur quod sensibile esset compositum ex insensibilibus, quod est falsum; consequentia tenet quia dividendo corpus in quo existunt qualitates sensibiles, nisi qualitates sint in infinitum divisibiles, deveneretur ad aliquam partem non habentem qualitatem, et per consequens non erit sensibilis; et si non devenietur ad aliquam partem non habentem qualitatem, tunc erit ulterius divisibilis, et sic in infinitum erit processus in divisione, et habetur contra conclusionem; vel erit status et habetur consequens. Quarto tunc sensibile esset insensibile; consequens implicat; consequentia probatur, quia in tali divisione vel tandem devenietur ad partes indivisibiles, vel continue procederetur ultra in divisione; si detur primum, tunc illa pars erit insensibilis quia indivisibile non sentitur, et per consequens illa qualitas indivisibilis esset insensibilis. Nec potest dari secundum, quia tunc haberetur propositum; et istas rationes tres ultimas facit Philosophus in textu."

What is interesting to remark is that, as evidenced by this commentary, by the mid-14th-century all the arguments originally presented by Aristotle in order to argue for and against the infinite divisibility *per accidens* of sensible qualities had become part of the debate concerning the existence on their own (in the actual or in a possible world) of ("permanent"[940]) sensible qualities that are not perceptible in act due to the smallness of the matter to which they are united. In this new conceptual framework, the argument employed by Aristotle against the (potential) infinite divisibility *per accidens* of sensible qualities (i.e., the intrinsic limitations of sensory powers) is employed to argue that not all sensible qualities (existing, in this case, in a possible world without the corrupting action of the containing medium) are perceptible in act (arguing, therefore, against the validity of the Aristotelian principle of the coextension of the sensible world and of the perceptible one in the possible world concerned), whereas the two arguments employed by Aristotle in favour of the idea that sensible qualities are (potentially) infinitely divisible *per accidens* are employed to argue that all sensible qualities (existing in the same possible world, and *a fortiori* in the actual one) are perceptible in act (arguing, therefore, in favour of the validity of the Aristotelian principle of the coextension of the sensible world and of the perceptible one in the possible world concerned).

To the three arguments mentioned above among those presented by the commentator to deny the existence on their own (in a possible world without the corrupting action of the containing medium) of sensible qualities that are not perceptible in act, the commentator replies in a forceful way in the following passage, where it clearly emerges that, following Jandun and Buridan, he also believes that even in the actual world there are "permanent" sensible qualities existing on their own that are not perceptible in act:

> To the second [argument] it is said that many are the magnitudes posited on their own which are not cognised by the cognition of the sense, because they are not sufficient to move the sense due to the weakness of the sensible quality, and, as a consequence, they are not cognised by the intellective cognition obtained from the sensitive [one]. To the third [argument] it is conceded the consequence that some body is composed of parts that are not perceptible by the sense; nevertheless, it stands well together [with this consequence] that in some body there are sensible qualities and, however, they are not perceived in a part perceived on its own due to their

[940] Although, as said above, the commentator under discussion does not believe in a "piecemeal" conception of substantial change, and therefore not even in "ephemeral" sensible qualities that are not perceptible in act.

> weakness, and as such [it stands that] they are insensible [i.e., not perceptible in act], but not because they do not have any quality. To the fourth [argument] it is denied the consequence in the same way and taking 'sensible' and 'insensible' with the same meaning [as in the reply to the third argument]; to the proof [of this] it is said that one would proceed continuously further in such division and eventually it would be reached a part so small that it will not be perceived alone but together with other [parts]; or better, the quality would be corrupted due to its smallness [in the actual world, and considering the threshold of corruption by the containing medium to be inferior to that of perceptibility]. Neither is it inconvenient that one and the same entity is composed of parts that are perceptible when existing on their own and parts that are not perceptible when similarly existing on their own: even though those insensible parts [i.e., the parts that are not percepible in act on their own] put together would make a single body [perceptible in act] in some way; so, however small those parts are, still they are perceived united to a [larger] whole[941].

The conceptual model presented by the commentator, therefore, like the one presented by Jandun and Buridan, is the following one: both in the actual world (following the idea, advanced by Jandun and accepted by Buridan and also by Burley, that the threshold of corruptibility of sensible qualities is inferior to the threshold of their perceptibility) and in a possible one without the corrupting action of the containing medium there are sensible qualities existing on their own that, due to the smallness of the matter to which they are united, are not perceptible in act (the commentator, referring to the actual world, even says that they are many); therefore, in both cases the Aristotelian principle of the coextension of the sensible world and of the perceptible one is rejected; in all these cases, it is never suggested that sensible qualities remain somehow "active", according, once again, to the Parisian commentary tradition and against the Oxford one; all these sensible qualities are still potentially perceptible in the third sense, that is, they can become perceptible in act by uniting to a sufficient number of other parts existing under the same condition, according to the main feature of Jandun's and Buridan's "corpuscularian"

[941] NICOLAUS ORESME sive ALBERTUS DE SAXONIA, *Quaestiones super De sensu et sensato*, q. 17, ed. AGRIMI, p. 204: "Ad secundum dicitur quod multe sunt magnitudines posite seorsum que non cognoscuntur cognitione sensus, quia non sunt sufficientes movere sensum propter debilitatem qualitatis sensibilis; et per consequens non cognoscentur cognitione intellectiva habita ex sensitiva. Ad tertium conceditur consequentia, quod aliquod corpus componitur ex insensibilibus sensu; ymmo stant bene simul quod in aliquo corpore sint qualitates sensibiles et tamen non sentiuntur parte seorsum percepta propter earum debilitatem, et ut sic essent insensibiles, sed non quia nullam haberent qualitatem. Ad quartum negatur consequentia eodem modo et respectu eiusdem accipiendo sensibile vel insensibile; ad probationem dicitur quod continue procederetur ultra in tali divisione et tandem erit deveniendum ad partem ita parvam que non sentietur se sola sed bene cum aliis; ymmo propter eius parvitatem corrumperetur qualitas. Nec est inconveniens quod una et eadem res componatur ex partibus sensibilibus positis seorsum et partibus insensibilibus similiter seorsum positis: licet illa insensibilia simul posita facerent unum corpus qualitercumque; sic, quantumcumque ille partes sint parve, tamen sentiuntur coniuncte toti."

models; finally, while in the possible world considered sensible qualities are, therefore, (potentially) infinitely divisible, in the actual one, below a certain threshold of smallness of the matter to which they are united (one, however, inferior to the threshold of their perceptibility in act) they are corrupted by the action of the containing medium. Note, finally, that the idea that sensible qualities that are not perceptible in act on their own can become perceptible in act as part of a larger whole is further qualified by the commentator, following Buridan, by referring to the idea that, even in this last condition, such parts cannot be perceived "distinctly (*distincte*)[942]".

4.4.3.2. A Commentary Attributed to Nicole Oresme and Albert of Saxony on *Minima sensibilia*: A Summary

The anonymous *De sensu* commentary that has been attributed both to Nicole Oresme and to Albert of Saxony is likely the product of an anonymous *magister artium* active around the mid-14th century (likely in the first decades of its second half) and showing close ties to the "Buridanian" intellectual *milieu*.

The importance of the commentary for the thesis, therefore, lies in the fact that it shows effectively the state of the debate on *minima sensibilia* after all the innovations brought forth especially by John of Jandun and, following him, by John Buridan (without leaving aside Walter Burley's role). Unfortunately, the commentary is frequently synthetic in its formulations, an aspect that makes it difficult to reconstruct the details of the position it takes.

What can be certainly said, overall, is the predominant influence on the author of the commentary in his analysis of *minima sensibilia* is that of Buridan. This influence appears concerning both of the central aspects of Buridan's doctrine of *minima sensibilia* (although to different extents).

First of all, this influence is already evident in the fact that the commentator discusses the issue of the divisibility of sensible qualities *in partes graduales* as a third

[942] NICOLAUS ORESME sive ALBERTUS DE SAXONIA, *Quaestiones super De sensu et sensato*, q. 17, ed. AGRIMI, p. 204: "Quarta conclusio est quod qualitates sensibiles sumpte secundum se in comparatione ad sensum, quod ab eo percipiantur, non sunt in infinitum divisibiles, idest non quacumque qualitate sensibili data, quam sensus potest sentire separata a suo toto, minorem potest quantumlibet sentire distincte; probatur per primam rationem ante oppositum."

kind of division in addition to their *per se* and their *per accidens* (i.e., *in partes quantitativas*) divisibility. The commentator, however, abolishing Buridan's fine-grained distinctions between primary and secondary qualities, takes the view that all sensible qualities possess an infinite number of degrees of intensity, although, crucially, it is not clear whether such degrees are assimilated to their species or not.

For what concerns, instead, the divisibility of sensible qualities according to the division of the matter to which they are united, i.e., the issue of *minima sensibilia* proper, and specifically the issue of the existence of their own, in the actual world, of sensible qualities that are not perceptible in act, the author of the commentary comes closer to Jandun than to Buridan. On the one hand, indeed, he is explicitly committed to the view that there are in the actual world entities existing on their own in a size located between the threshold of their perceptibility and that of their corruptibility whose sensible qualities are not perceptible in act (what Buridan had called *insensibilia propter parvitatem*). Moreover, he clearly understands these sensible qualities as being able to form sensible qualities that are perceptible in act by uniting in sufficiently great aggregates, although, in agreement with Buridan, they can never be perceived "distinctly" within such aggregates. On the other hand, however, the author of the commentary denies the existence in the actual world of "ephemeral" sensible qualities that are not perceptible in act. Indeed, he clearly does not share the "piecemeal" view of substantial change and, more in general, the idea that the corruption of extremely small material substances (or portions thereof) is a temporally extended process. Rather, as Jandun, he takes such a process to be instantaneous, so that the potentially infinite divisibility of sensible qualities through the division of the matter to which they are united is accepted only in a possible world deprived of the corrupting action of the containing medium.

All in all, therefore, the commentator's discussion of *minima sensibilia* shows the clear influence of the "mature" 14th-century Parisian debate best represented by Buridan (and, indirectly, of Jandun's own position). Nevertheless, the discussion provided by the commentator shows a lack of interest both for Buridan's precise epistemological discussions concerning the limits of perception and of Jandun's analysis concerning the relation between the essence and the operation of a sensible quality. The text, instead, limits itself to setting forth a set of conclusions, with their supporting arguments and objections, that already shows the typical "textbook-like" structure of late 14th- and early

15th-century commentaries on the Aristotelian *libri naturales*. Also the language used by the commentator frequently betrays its connection to the same intellectual period[943].

As a result of all these considerations, the commentary represents an important example of the passage from the "mature" to the "late" 14th century Scholastic Aristotelianism and, as such, it constitutes an appropriate point of arrival of the itinerary proposed throughout this chapter and the previous one. Indeed, in many ways, this commentary closes the debate on *minima sensibilia* brought forth, especially, in the first half of the 14th century while, at the same time, already foreshadowing the way in which the issue of *minima sensibilia* would have been discussed by subsequent commentators (such as Marsilius of Inghen, to remain well within the limits of the 14th century).

4.5. Conclusions

It is extremely difficult to summarise a century of the Medieval Latin debate on *minima sensibilia* in a few pages. Nevertheless, a summary of it must be given and a few aspects of it must be stressed at this point if the theoretical implications of the debate are to be fully grasped. First and foremost, as I have shown throughout this chapter and the preceding one, the gist of the Aristotelian solution was almost invariably accepted by Medieval Latin commentators. That is to say, no Medieval Latin commentator (save for Albert the Great) challenged the idea that sensible qualities are infinitely divisible *per accidens* insofar as they exist as parts of a perceptible whole, but that, if they were separated from it, all the portions of matter too small for their sensible qualities to be perceptible in act would be corrupted by the containing medium. This brought the large majority of the commentators analysed to adopt a doctrine of "extrinsic" *minima sensibilia secundum corruptionem*.

[943] For instance, the commentator makes an explicit use of the conceptual couple of *maximum quod non-minimum quod sic* in connection with *minima sensibilia*, therefore mirroring the same language that, in the debate on *minima naturalia* as witnessed in *Physics* commentaries, had started to be used at least from Albert of Saxony onwards (as I have shown in Chapter 2 of the thesis): "Sed dubitatur utrum in partibus divisis a toto sit dare maximam partem quam non potest sentire, vel minimam quam potest sentire. Dicitur quod est dare maximam partem quam sensus non potest sentire, et illam partem sensus non poterit sentire et nullam minorem, et quacumque maiori illa est aliqua minor quam potest sentire" (NICOLAUS ORESME sive ALBERTUS DE SAXONIA, *Quaestiones super De sensu et sensato*, q. 17, ed. AGRIMI, p. 205). Another aspect that links the commentary to this new intellectual period is the frequent insertion of so-called "*problemata* literature" (i.e., specific questions concerning a very detailed topic, usually not directly related to the main issue at hand and mostly deriving from the medical tradition) within the discussion of most of its *quaestiones* (although not in the one concerning *minima sensibilia*).

The main exception, apart from Albert, are the commentators, particularly Walter Burley and John Buridan, but possibly also Radulphus Brito and the two authors of the commentaries of ms. Vat. Lat. 2170 and of ms. Vat. Lat. 3061, that adopted a temporally extended conception of substantial change. In their view, indeed, any given *minimum sensibile secundum corruptionem* is still (potentially) infinitely divisible through the potential infinite divisibility of the time through which its corruption occurs.

To them, one should also add the cases of commentators who accepted the existence of *minima sensibilia secundum corruptionem*, yet qualified the doctrine in a way different from Aristotle's original one. Indeed, John of Jandun, Walter Burley, John Buridan and the author of the commentary attributed both to Nicole Oresme and to Albert of Saxony, adopted a theory according to which the minimal quantity of material substances capable to resist to the corrupting action of the containing medium is inferior to the minimal quantity of material substances whose sensible qualities are perceptible in act.

A still different case, concerning *minima sensibilia secundum corruptionem*, is that of Thomas Aquinas, who, although did not challenge the idea that the sensible qualities of portions of matter below a given threshold of smallness are corrupted and replaced by those of the containing medium, denied that the medium had any causal role to play in this process of corruption.

The peculiarity of Aquinas' position becomes understandable when one considers that his overall position concerning *minima sensibilia* is based on his position on *minima naturalia* analysed in Chapter 2. There, I have shown that Aquinas believes in a doctrine of "intrinsic" *minima naturalia secundum formam*, according to which substantial forms metaphysically determine the (maximal and) the minimal quantity of matter they can inform, and they are corrupted if such minimal quantity of matter is divided into smaller parts. When dealing with the issue of *minima sensibilia*, Aquinas limited himself to extend his position on *minima naturalia*. Indeed, insofar as the accidental forms of sensible qualities cannot exist in a portion of a material substance whose substantial form has been corrupted, it follows that the *minima naturalia secundum formam* are also *minima sensibilia secundum formam*. The only reason why there are *minima naturalia* and *minima sensibilia* in nature, according to Aquinas, is the weakness of the preserving power of substantial forms.

A partial doctrine of *minima sensibilia secundum formam* is also held by Peter of Auvergne, who, however, is careful in recognising the role of the medium in corrupting portions of material substances in the actual world. Peter, therefore, accepts a doctrine of *minima sensibilia secundum corruptionem* in the actual world, but he recognises that, in a possible world deprived of the corrupting action of the containing medium, the accidental forms of sensible qualities would metaphysically determine the (maximal and) minimal quantity of matter in which they could exist, so that their forms would be immediately corrupted in quantities of matter smaller than the minimal one. Remarkably, in this sense, Peter's doctrine of *minima secundum formam* does not, in this case, make reference to the role of substantial forms but, differently from Aquinas', is explicitly a doctrine of *minima sensibilia secundum formam*.

The reason why Peter considered the case of a possible world without the corrupting action of the containing medium is the fact that Aristotle, at *De sensu* 6, 446a10-15, suggested that, in the absence of the corrupting action of the containing medium, there could be sensible qualities existing on their own that are not perceptible in act. This issue, already underlined by Alexander of Aphrodisias in his commentary, gave rise to a crucial discussion concerning "intrinsic" *minima sensibilia* in the case of most Medieval Latin commentators. The question concerning the existence on their own of sensible qualities that are not perceptible in act was hotly debated among Medieval Latin commentators.

Both Aquinas and Peter of Auvergne denied this possibility (not only in the actual world, but also as a conceptual possibility), taking their *minima secundum formam* to be still perceptible in act. Nevertheless, all the other Medieval Latin commentators analysed (save for John Felmingham (?), who does not discuss the Aristotelian remark at 446a10-15, and who therefore does not take a position on "intrinsic" *minima sensibilia*) while accepting, as a conceptual possibility at least, the existence of "intrinsic" *minima sensibilia*, recognised that, at least in a possible world without the corrupting action of the containing medium, the accidental forms of sensible qualities could inhere in portions of matter of any size whatsoever, even, at the limit, potentially infinitely small ones. Thus, the "intrinsic" *minima sensibilia* they accepted concerned the minimal portions of matter in which, in a possible world without the corrupting action of the containing medium, the accidental forms of sensible qualities united to it could have been perceptible in act (while

the sensible qualities united to smaller portions of matter were taken to be "imperceptible" in act).

More precisely, these commentators adopted doctrines of "intrinsic" *minima sensibilia* based on the ability for these forms to operate on the outside environment, and, more precisely, to perform their proper operation to act on the external senses so as to engender a sensation. In the Oxford commentary tradition (the one represented by Roger Bacon, the anonymous commentary of ms. Merton 276 and even the anonymous commentary of ms. Oriel 33), however, these were predominantly characterised as what I have called, since Chapter 2, *minima secundum sensum*. That is, it was usually assumed that sensible qualities are always able to act, regardless of the size of the matter to which they are united, but, below a certain threshold of smallness, the external senses are not able to perceive them, due to the weakness of sensory powers. On the contrary, in the Parisian commentary tradition "intrinsic" *minima sensibilia* were mostly understood as the minimal quantity of matter required for sensible qualities to possess the power to act on the senses so as to engender a sensation, so that sensible qualities existing in quantities of matter smaller than the minimal one would not be able to act at all (in partial disagreement with Jandun's and Brito's doctrine of *minima naturalia* as discussed in Chapter 2).

All the commentators who either adopted a temporally extended conception of the process of corruption of extremely small portions of material substances and of their sensible qualities existing on their own, or who posited a threshold of corruptibility inferior to that of perceptibility accepted the existence of "intrinsic" *minima sensibilia* not only as a conceptual possibility, but also in the actual world. They all tended to view them as the minimal portion of matter existing on its own in which sensible qualities possess the power to perform their proper operation, i.e., that of acting on the senses so as to engender a sensation. Their doctrine was therefore in agreement with the position concerning "intrinsic" *minima sensibilia* developed within the Parisian commentary tradition to which all of them predominantly belonged.

As it should be clear from this brief summary, the main point of contention of the Medieval Latin debate on *minima sensibilia* (indeed, the most important theoretical issue at stake) concerned the last issue I have mentioned, namely, the possibility of the existence, either merely as a conceptual possibility or also in the actual world, of sensible

qualities that, due to the smallness of the matter to which they are united, are not perceptible in act by the external senses. It is important, therefore, to consider this issue in more detail.

First of all, it must be remarked that on the acceptance of the existence in the actual world of sensible qualities that are not perceptible in act depended the validity of one of the central principles of Aristotle's theory of perception (a principle that also features prominently in the text of *De sensu* 6), namely, the principle of the coextension of the sensible world and of the perceptible one. According to this principle, no entity existing on its own in the natural world, insofar as it is sensible, can escape being detected by the senses under the appropriate conditions.

The issue of the existence on their own of sensible qualities that are not perceptible in act features prominently already in Roger Bacon's *De sensu* commentary, where it is clearly admitted that, in a possible world without the corrupting action of the containing medium, there could well be sensible qualities that are not perceptible in act. Remarkably, it is suggested by Bacon that such sensible qualities, although they would not be perceived by the senses, would not exist uselessly, insofar as they would still serve the purpose of demarcating the natural world from the intelligible one.

The issue also takes centre stage in Albert the Great's *De sensu* commentary. Albert's discussion is built on an overall scenario (which has no equivalent among the Medieval Latin commentators discussed in this thesis) where the containing medium does not play any role whatsoever, and where the existence on their own of portions of matter too small to be perceptible in act is accepted as a correct description of the actual world. Still, these portions of matter, that Albert, in an explicit confrontation with Democritus' atomism, calls *ultima minima* (insofar as they correspond to "minimal extensions" of matter), are not taken to be endowed with the accidental forms of sensible qualities themselves, but rather only with the *inchoationes* of such forms. By resorting to this peculiar concept of his metaphysics and natural philosophy, used in an original way in the context, Albert explains in a "corpuscularian" way the formation and the structure of the sensible qualities that we are able to perceive as, ultimately, the result of the union of a certain number of *ultima minima* endowed with the *inchoationes* of these same sensible qualities.

If possible, however, the debate became even more heated after 1260, that is, after the completion by William of Moerbeke of the Latin translation of Alexander's commentary on the *De sensu*. Thomas Aquinas immediately recognised the "danger" of insisting on the idea that, in the absence of the corrupting action of the containing medium, there could be sensible qualities existing on their own without being perceptible in act, and he tried to extend the validity of the principle of the coextension of the sensible world and of the perceptible one even to a possible world without the corrupting action of the containing medium.

Towards the end of the 13th century, however, and especially at the beginning of the 14th, not only the existence on their own of sensible qualities that are not perceptible in act came to be commonly admitted in the case of a possible world without the corrupting action of the containing medium, but it also started to be tentatively applied for the first time (leaving aside the isolated precedent of Albert's commentary on the *De sensu*) to the actual world.

This major intellectual development was mostly due to two (largely parallel, yet ultimately independent from each other) factors. On the one hand, starting at least with Radulphus Brito's *De sensu* commentary (but also with the two anonymous commentaries preserved in ms. Vat. Lat. 2170 and in ms. Vat. Lat. 3061), Medieval Latin commentators started to apply to the discussion of *minima sensibilia* an innovative view of substantial change considered as a temporally extended process. Under this new view, later fully articulated on the one hand by Walter Burley (in the form of the idea that corruption is the inclusive limit of alteration) and on the other hand, in a different way from Walter Burley, by John Buridan, Nicole Oresme and Albert of Saxony among others (adopting what I have called the "piecemeal" conception of substantial change), portions of matter too small to be perceived in act, while separated from the whole to which they belong, preserve their sensible qualities for at least a very short span of time, the one needed for the process of corruption to be fully achieved, and therefore, for this time, their sensible qualities exist on their own without being perceptible in act.

Alongside these "ephemeral" sensible qualities existing on their own in the actual world without being perceptible in act, another, "permanent" class of sensible qualities existing on their own in the actual world without being perceptible in act came to be accepted due to the influence of the second innovative factor influencing the early 14th-

century debate on *minima sensibilia*. This second factor is represented by the idea, proposed for the first time, in a fully self-conscious way, by John of Jandun (but also accepted by Walter Burley, John Buridan, and the anonymous author of the commentary attributed both to Nicole Oresme and to Albert of Saxony), that, regardless of whether the process of corruption of extremely small portions of matter (and of their sensible qualities) happens instantaneously or over time (Jandun held to the first, more "traditional" view), the threshold required for the corruption of material substances (and therefore of their sensible qualities) is inferior to that of their perceptibility in act. That is to say, contrary to Aristotle's original intention, Jandun explicitly admitted that there is, in the actual world, a certain "size-range" within which portions of matter existing on their own can retain their sensible qualities (together with their substantial form, of course) without being corrupted by the containing medium (whose action they are strong enough to oppose), but, at the same time, without being perceptible in act. On this model, such portions of matter can, however, become perceptible in act by uniting to other portions of matter existing under the same condition. In this sense, the model proposed by Jandun, taking advantage of the third meaning of potentially perceptible introduced by Aristotle (and developed by Alexander of Aphrodisias), puts forth a partially "corpuscularian" understanding of the sensible world (and, from an epistemological point of view, of perception itself), although its full implications are neither developed by Jandun, nor by any of the subsequent commentators accepting his model.

Interestingly, while the "piecemeal" conception of substantial change (and, more in general, the idea that substantial change is a process taking place through an extended interval of time) was met with resistance in the second half of the 14th century, even at Paris, as it is evident in the *De sensu* commentary attributed both to Nicole Oresme and to Albert of Saxony, whose Parisian origin is beyond doubt, the existence on their own in the actual world of sensible qualities that are not perceptible in act, together with Jandun's "corpuscularian" model, was not only explicitly endorsed by commentators who adopted the "piecemeal" view of substantial change, such as John Buridan, but it was also accepted by commentators who rejected it, such as the author of the commentary attributed both to Nicole Oresme and to Albert of Saxony. This shows that, in the long run, the idea that the threshold of corruptibility of sensible qualities is inferior to that of their perceptibility came to play a far more prominent role than the temporally extended

understanding of substantial change in the acceptance of the existence on their own, in the actual world, of sensible qualities that are not perceptible in act.

Nevertheless, the two factors that brought about the acceptance of the existence on their own, in the actual world, of sensible qualities that are not perceptible in act did not develop entirely independently from each other. Indeed, it might be said, at the very least, that the acceptance of Jandun's model was favoured by the adoption of the "piecemeal" view of substantial change, as it is witnessed by the fact that the two commentators closest to Jandun (namely, the authors of the commentary preserved in ms. BnF Lat. 16160 and in ms. Oriel 33), but who did not accept the "piecemeal" view of substantial change, did not endorse Jandun's model, limiting their discussion concerning the existence on their own of sensible qualities that are not perceptible in act to a possible world without the corrupting action of the containing medium.

All in all, however, the complex intellectual process that brought from an original (very brief) remark made by Aristotle concerning an "innocent" thought experiment to a major change in the conception of the composition of the natural world and of its relation with the external senses is, I believe, not only a remarkable fact in itself, but also a wonderful tribute to the intrinsic creativity and intellectual ingenuity of the Medieval Latin Aristotelian commentary tradition.

Apart from this aspect, however, the acceptance of the existence on their own (either as a mere conceptual possibility or also in the actual world) of sensible qualities that are not perceptible in act forced Medieval Latin commentators to change their understanding of two other extremely important ontological (and epistemological) issues concerning the nature of sensible qualities and their relation with the senses.

The first one is the issue of the relation between the essence of a sensible quality and its proper operation, interpreted as the one of acting on the external senses so as to engender a sensation. Indeed, especially in the case of John of Jandun's commentary and of those closest to it (namely, the anonymous commentary of ms. BnF Lat. 16160 and the anonymous commentary of ms. Oriel 33) it became commonplace to refer, in this context, to an argument from Averroes' *Long Commentary* on *Metaphysics* Θ, claiming that an entity which cannot perform its proper operation necessarily loses its essence, and to apply it to the case of sensible qualitites that exist on their own without being perceptible in act (either in the actual world or in a possible one). Jandun makes use of the argument

in order to claim that, for a sensible quality to be defined as 'sensible', what is needed is not the power to perform its proper operation, but the *disposition* to acquire such power when present in a sufficient quantity of matter. More than this, Jandun also suggests that, regardless of such a disposition, sensible qualities can be called 'sensible' already for the fact that they demarcate the natural world from the mathematical one, in a way reminiscent of Bacon's original formulation of this point. In this way, Jandun finds a way to provide a dispositional and predominantly non-relational characterisation of sensible qualities that are not perceptible in act that (at least partially) responds to Averroes' argument, articulating in more explicit terms, moreover, an intuition that had already been formulated by commentators such as Radulphus Brito and the two anonymous authors of the commentaries of ms. Vat. Lat. 2170 and of ms. Vat. Lat. 3061. The author of the commentary of ms. BnF Lat. 16160 follows Jandun's lead, while the author of the commentary of ms. Oriel 33 weaves Averroes' argument together with another one from Averroes' *Long Commentary* on *Metaphysics* H, already referred to by Peter of Auvergne, according to which, such as substantial change makes prime matter known, so the performance of its proper operation makes a form known. This epistemological argument is put into an inferential relation according to which it takes priority over the ontological one of the *Long Commentary* on *Metaphysics* Θ, but, in the end, also this commentator replies to both according to Jandun's basic argumentative strategy.

The further issue regarding which the acceptance of the existence on their own, as a conceptual possibility and also in the actual world, of sensible qualities that are not perceptible in act had important consequences is that of the relation between a sensible quality and its corresponding external sense as an instance of the correspondence between an active power and a corresponding passive one. This issue (which was present *ab initio* in the Medieval Latin debate on *minima sensibilia*, as the commentaries attributed to Adam of Buckfield and to his circle clearly show) features most prominently in Brito's commentary and, especially, in the two anonymous commentaries of ms. Vat. Lat. 2170 and of ms. Vat. Lat. 3061. The authors of these commentaries noticed that the existence of sensible qualities that are not perceptible in act entails the existence of an active power to which does not correspond any passive power whatsoever. This issue was solved, in such commentaries, with a strategy paralleling the one they adopted concerning the issue of the relation between the essence and the proper operation of sensible qualities, namely,

by claiming that the correspondence between active and passive powers (such as the link between the essence and the proper operation of any given entity) is a fundamental principle in the natural world, but only when both powers (or the entity concerned, for the link between essence and proper operation) are present under a suitable quantity.

The solutions given by Medieval Latin commentators to these two latter issues allow to uncover a deeper change taking place in Medieval Latin conceptions of sensible qualities, whose "discovery" is, I believe, probably the most important result of the study of the Medieval Latin debate on *minima sensibilia* that I have conducted throughout this thesis, and especially in the last two chapters. Indeed, by looking at the way in which the debate unfolds from mid-13th- to mid-14th-century *De sensu* commentaries, both English and Parisian ones (although the latter are much more frequently preserved than the former) the overall impression one gets is that the "traditional" way of conceiving sensible qualities in the Aristotelian tradition, that is, as the *active* principle of sensation and in an extremely tight relation to the external senses on which they act, progressively leaves the ground to a very different conception, where the natural world is ultimately made of sensible qualities that are frequently "inactive" (according to the Parisian commentary tradition) or in any way not sufficiently "active" so as to be able to engender a sensation (according to an Oxford commentary tradition stretching at least from Roger Bacon in the mid-13th century to the anonymous authors of the commentaries of ms. Merton 276 at the end of the 13th century and of ms. Oriel 33 at the beginning of the 14th century). Thus sensible qualities, far from being defined by their ability to act on the senses (as it was in Aristotle), are fully capable of existing on their own without any direct relation to the senses. It is difficult to deny that such a conception, if my interpretation is right, betrays an understanding of sensation where sensible qualities play a progressively more "passive" role (and, as I have already remarked, in Jandun's thought also the senses, thanks to the so-called *sensus agens*, played a much more active role than it was normally admitted in the Aristotelian tradition – although, as I have also made clear, Jandun considered this "active" role to be exercised exclusively onto sensible species that had already been received by the senses). From this point of view, investigating the Medieval Latin debate on *minima sensibilia* provides a unique hermeneutical key to understand the way in which commentators conceived the ontology and the epistemology of sensible qualities.

CONCLUSIONS

This thesis has conducted a comprehensive study of the interpretations of the Aristotelian passage of *De sensu* 6, 445b3-446a20 provided during the 13th and the 14th century (ca. 1250-ca. 1350). In the text, Aristotle raises an *aporia* concerning sensible qualities, i.e., the so-called issue of *minima sensibilia*. If the matter of material substances is (potentially) infinitely divisible, then are the sensible qualities associated with this matter (potentially) infinitely divisible through its division? If they are (potentially) infinitely divisible, then there should exist in nature an infinite sensory power capable of perceiving them, something which runs counter to Aristotle's keen awareness of the intrinsic limits of any natural power. On the contrary, if they are not (potentially) infinitely divisible, then the ultimate building blocks of sensible magnitudes will turn out to be fully insensible entities. Moreover, such entities will lie entirely beyond the grasp of human knowledge, since they will neither be perceived by the senses (being insensible) nor be cognised by the intellect, since the senses constitute the only epistemic gateway that the intellect has to the "outside" natural world. Aristotle's solution to the *aporia* is based on a careful distinction between the notions of 'potentially perceptible' and of 'actually perceptible'. More than that, Aristotle even distinguishes between three different senses of 'potentially perceptible'. Thanks to these conceptual distinctions, Aristotle is able to claim that any portion of matter whatsoever is always potentially perceptible insofar as it contributes to the actual perception of the whole to which it belongs. Nevertheless, if a portion of matter is "physically" separated from the whole to which it belongs, below a certain threshold of smallness it cannot become actually perceptible on its own. Below this same threshold, however (if not even slightly above), portions of matter separated from the whole to which they belong are immediately corrupted by the containing medium, so as to lose their own sensible qualities and to acquire those of the medium itself. Nevertheless, as Aristotle remarks in a final twist, in the absence of the corrupting action of the containing medium such portions of matter would remain potentially perceptible, insofar as they could become actually perceptible by uniting with a sufficient quantity of matter endowed with the same sensible qualities.

The intuition lying behind this thesis is that the Medieval Latin interpretations of Aristotle's discussion of this *aporia*, and therefore of the issue of *minima sensibilia*,

constitute a unique vantage point to study Medieval Latin conceptions of sensible qualities in their own right. Indeed, sensible qualities are particularly elusive entities in the Aristotelian tradition. On the one hand, insofar as accidental forms they depend on a substantial form in order to exist in concrete hylomorphic compounds. On the other hand, they are the entities causally responsible for (and essentially ordered to) the production of sensations in the external senses. On both counts, sensible qualities are considered not in themselves, but rather insofar as they are in relation with other entities, namely, substantial forms and the sensory powers of the external senses. On the contrary, *De sensu* 6, 445b3-446a20 represents one of the very few Aristotelian texts where sensible qualities (significantly, all of the proper sensibles, and not only one or some of them[944]) are primarily discussed in their own right and where a specific understanding of their constitution and features insofar as they exist in hylomorphic compounds is explicitly thematised. This is not only so in Aristotle, but, as I have shown throughout the thesis, it is even more so in the Medieval Latin commentary tradition.

Certainly, throughout the Medieval Latin *De sensu* commentaries that I have analysed in Chapters 3 and 4, a significant part of the commentators' attention is devoted to discussing how the *aporia* raised by Aristotle in the text impacts the ontological and epistemological issue of the relation between sensible qualities and the external senses. Moreover, these commentators always assumed, as part of the background to their discussion, the ontological relation of dependence of the accidental forms of sensible qualities on the corresponding substantial ones. The most evident case in point in this respect is certainly Thomas Aquinas, who claimed both that if, *per impossibile*, there were (potentially) infinitely small sensible qualities one should also posit (potentially) infinite sensory powers able to perceive them and that, given the fact that substantial forms metaphysically determine the maximal and minimal quantities of matter which they can

[944] This parenthetical remark gives me the possibility to clarify a further issue that I have not explicitly addressed throughout the thesis. Indeed, throughout the thesis I have taken for granted that the issue of *minima sensibilia* (and therefore also all its possible solutions) applies equally to all the proper sensibles of the five external senses. This has meant that I have disregarded the distinction between primary and secondary qualities, whose importance in Scholastic Aristotelianism can hardly be denied, and also the specificities of some proper sensibles, most notably those of sound (which, however, is almost entirely neglected in the *De sensu* as a whole). I have felt legitimised to do so to the extent that this same basic stance seems to have been shared by all the Late Ancient and Medieval commentators I have discussed throughout the thesis.

inform, that same quantity also represents the maximal and minimal quantity of matter in which the accidental forms of their own sensible qualities can exist.

Nevertheless, progressively, the Medieval Latin reflection on *De sensu* 6, 445b3-446a20 led commentators to consider sensible qualities in their own right and to develop an original and remarkably innovative account of their ontology and epistemology. Although the precise contours of the progressive process of emergence of this account remain difficult to be ascertained, I have shown that the basic intuition lying behind it is already present in Radulphus Brito's *De sensu* commentary and in the two anonymous commentaries of ms. Vat. Lat. 2170 and ms. Vat. Lat. 3061, all three dating, presumably, from the last decade of the 13th century or from the first decade of the 14th century, and all originating from the debate of the Parisian Faculty of Arts. The account, then, appears to have taken its final shape by ca. 1310, as it can be ascertained from an anonymous commentary preserved in ms. BnF Lat. 16160 and, especially, from John of Jandun's commentary. The same account is, afterwards, almost taken for granted by John Buridan and the other masters commenting on the *De sensu* at the Parisian Faculty of Arts (and not only) around ca. 1350.

What are the main features of this account? The basic intuition grounding it, the one already present, as said, in Brito's commentary and in the two anonymous ones preserved in ms. Vat. Lat. 2170 and ms. Vat. Lat. 3061, is the idea that sensible qualities can exist on their own in hylomorphic compounds even when they do not have the power to act on the senses, due to the smallness of the matter with which they are associated. This intuition is in itself extremely innovative, insofar as it goes against two fundamental principles of Scholastic Aristotelianism. The first one is Aristotle's adamant belief that all entities existing on their own in the "outside" natural world must be able to engender a sensation in the external senses and that, therefore, sensible qualities must be defined by the power to act on the external senses so as to engender a sensation. That is to say, according to Aristotle no material substance (or portion thereof) existing on its own in the "outside" natural world lies fully beyond the grasp of the external senses (this is what I have called the principle of the 'co-extension of the perceptible world and of the sensible one'). This principle, needless to say, brings with it a strong epistemological "optimism" that characterises Aristotle's entire theory of perception. The second principle that is violated by positing that sensible qualities can exist on their own without having the

power to perform their proper operation (i.e., that of acting on the senses so as to produce a sensation) is a fundamental principle that, although clearly featuring in Aristotle, was mediated to the Latin West by Averroes' *Long Commentary* on the *Metaphysics*. According to such a principle, no entity can exist without the power to perform its proper operation, since the power to perform its proper operation is a necessary condition for an entity to possess its essence. That is to say, according to Averroes (and to Aristotle) an entity unable to perform its proper operation cannot be meaningfully said to be the same, numerically and essentially, than it was when it was able to perform its proper operation.

Although, at Brito's time, the validity of these two principles was not full-fledgedly denied, but merely restricted to sensible qualities (and forms more in general) existing in a sufficient quantity of matter, by Jandun's time these two principles, in the context of commenting upon *De sensu* 6, 445b3-446a20, were challenged head-on. Jandun's discussion is especially relevant, since it represents the most extended and detailed one in this respect. According to Jandun, regardless of the quantity of matter with which they are associated, sensible qualities should not be defined by the power to act on the senses so as to engender a sensation. Rather, sensible qualities should be defined simply according to the fact that they provide to the hylomorphic compound in which they inhere a *disposition* to acquire the power to act on the senses so as to engender a sensation under suitable conditions, most notably that of possessing a sufficient quantity of matter[945]. In Jandun's view, therefore, although the natural "outside" world remains

[945] The idea that sensible qualities (i.e., the accidental forms of the proper sensibles of the five external senses) are primarily dispositional properties, rather than causal agents, is an idea that resonates with some conceptions of sensible qualities in the Early Modern Age, from Boyle's to, especially, Reid's one. Throughout the thesis I have been extremely careful to avoid any temptation to project the Medieval Latin debate I was discussing onto the following periods of the history of philosophy, according to what I take to be a fundamental methodological principle that applies to any enquiry into the history of philosophy (and of Medieval philosophy in particular). Nevertheless, one aspect of the Medieval debate I have studied that seems to allow a (careful) comparison with the debate of the 17th and of the 18th century especially is exactly the idea of a dispositional role played by colours, sounds, odours, tastes and tactile qualities, although, of course, any dispositional account of this sort, in the Early Modern Age, contrary to what happended in the 13th and in the 14th century, was developed in the context of a broadly mechanistic overall theoretical framework (one taking as primary qualities the extension, figure, position, size, duration, and motion of the ultimate components of bodies – be they corpuscles or atoms – and primarily identifying sensible qualities with the appearances caused in the senses by these primary qualities). It would be of course extremely interesting to know if the dispositional account emerging in the early 14th century had a posterity in the following centuries. It is certainly something that I have the intention to investigate in the future. On Boyle's reflection on the dispositional role of sensible qualities, see especially P.R. ANSTEY, *The Philosophy of Robert Boyle (Routledge Studies in Seventeenth-Century Philosophy 5)*, London-New York, NY, Routledge, 2000, and D. KAUFMANN, *Schlocks, Locks, and Poisoned Peas: Boyle on Actual and Dispositive Qualities*, in D. GARBER, S. NADLER (eds.), *Oxford Studies in Early Modern Philosophy 3*, Oxford,

ultimately open to the possibility of being perceived and, therefore, of being cognised, it is perfectly acceptable that a significant part of it remains fully beyond what will ever be cognised through the senses. Accordingly, Jandun also claims that, for a form to exist (or, better, to persist in existence unchanged), what matters is not that it keeps possessing the power to perform its proper operation, but, rather, that it keeps possessing the disposition to acquire such a power under suitable conditions. Needless to say, this latter claim had far-ranging implications going well beyond the domain of sensible qualities, as Jandun himself is quick to point out by referring to the case of the intellective soul.

The possibility to apply this dispositional and predominantly non-relational account of sensible qualities to the ordinary course of nature (to the actual world, to conform to the terminology I have adopted throughout the thesis), nevertheless, depended on one additional modification of Aristotle's account in *De sensu* 6, 445b3-446a20. Indeed, as said, Aristotle excluded the possibility that a sufficiently small part of a material substance could come to exist on its own, by "physical" separation from the whole to which it belongs, without being perceptible, by positing a threshold of (actual) perceptibility of material substances lower than (or at the limit coinciding with) the threshold of their corruptibility by the containing medium. The corrupting action of the containing medium, therefore, acted, in Aristotle's conceptual model, as a "guardian" of the principle of the co-extension of the perceptible world and of the sensible one. Jandun disposed of this view by assuming that the threshold of perceptibility of material substances was higher than the threshold of their corruptibility. In other words, according to Jandun in the "outside" world there is a whole set of material substances falling within a certain size-range that are too small to be perceived by any sensory power whatsoever but that, nonetheless, remain in existence with their own sensible qualities, being capable to resist on their own to the corrupting action of the containing medium. Jandun captures this idea with the disitnction between what is *insensibile* and what is *insensibile omnibus modis*.

All these *insensibilia* (John Buridan will later effectively call them *insensibilia propter parvitatem*), in Jandun's view, are therefore the ultimate "building blocks" of actually perceptible sensible qualities, that is, of the entities from which the sensations of

Clarendon Press, 2006, pp. 153-198. For a dispositional interpretation of Reid's account of sensible qualities, see especially J. VAN CLEVE, *Problems from Reid*, New York, NY, Oxford University Press, 2015.

the external senses originate. The expression 'building blocks' is not chosen lightly. On the contrary, as I have tried to show, *De sensu* commentators, starting from Alexander of Aphrodisias and traversing the entire 13th century, kept reflecting on Aristotle's remark that, in the absence of the corrupting action of the containing medium, sensible qualities too small to be actually perceptible on their own would remain potentially perceptible and become actually so by uniting with a sufficient quantity of matter endowed with the same sensible qualities. It is in the context of this reflection that some of the most original conceptual innovations of the 13th-century commentary tradition on *De sensu* 6, 445b3-446a20 originated, such as Roger Bacon's notion of the *aptitudo* of sensible qualities and Albert the Great's notion of the *inchoatio formarum sensibilium* (in Albert's discussion, remarkably, the containing medium is *entirely* absent from the picture). It is by relying on this important intellectual tradition (either directly or indirectly) that Jandun, once he had posited the existence of *insensibilia* in nature, was able to characterise actually perceptible sensible qualities in clearly "corpuscularian" terms. According to him, the composition of a sufficient number of *insensibilia* gives rise to actually perceptible sensible qualities, and all these *insensibilia* are characterised by the fact that they possess, on their own, the same accidental form of the actually perceptible sensible quality they go on to form by their composition. Jandun, in a final *dubitatio* of his discussion, goes so far as to explicitly recognise that this is exactly the feature that distinguishes his model of the composition of actually perceptible sensible qualities from Democritus' one. Although in both models, indeed, the ultimate building blocks of actually perceptible sensible qualities are not perceptible, according to Democritus they are also ontologically different from the macro-entity that they form by their composition (which, on Democritus' view, does not even have a positive ontological characterisation, being merely a deceptive appearance of the senses). On the contrary, according to Jandun, the same hylomorphic structure of actually perceptible sensible qualities is shared both by *insensibilia* and by actually perceptible sensible qualities. In this way, Jandun also carries forth a fundamental insight that had already been formulated, in its basic form, by Albert the Great, again in an explicit confrontation with Democritus[946].

[946] This "corpuscularian" understanding of the constitution of actually perceptible sensible qualities out of insensible ones is certainly another aspect of the new account of sensible qualities under discussion whose posterity would be worth investigating. An important term of comparison, in the Early Modern Age, would certainly be Leibniz's theory of *perceptions insensibles* (intended as a subset of what Leibniz calls *petites*

It is a fact that this dispositional and predominantly non-relational account of sensible qualities had become the prevalent one by the mid-14th century (not only at Paris, as attested both by Buridan's commentaries and by a commentary attributed both to Oresme and to Albert of Saxony, but also at Oxford, as attested by the anonymous commentary preserved in ms. Oriel 33)[947]. By that time, the understanding of the relation between sensible qualities and their corresponding external senses had become widely different from the "traditional" Aristotelian picture where sensible qualities are defined by their ability to act on the external senses so as to engender a sensation. Indeed, although the existence of a clear relation between sensible qualities and external senses remained, even by that time, a fundamental belief of Scholastic Aristotelianism, the "distance" between sensible qualities and external senses had significantly increased. This had the consequence that the fundamental epistemological "optimism" that characterises Aristotle's theory of perception suffered a very serious blow. Certainly the implications of this progressive conceptual shift would require a further (and much more ambitious) investigation than the one I have conducted throughout this thesis. Still, it seems at least acceptable to claim that this increasing distance contributed to progressively deprive sensible qualities of the causally active character that marks them in Aristotle (the fact of their being the *principium motivum sensibilitatis*, to use the very effective expression adopted in the commentary of ms. Vat. Lat. 2170). Insofar as sensible qualities are primarily understood as dispositions, rather than as causal agents, their overall definition cannot but be significantly modified, and so also their overall conceptual outlook.

perceptions), i.e., of perceptions that are too minute for a sensitive being to be conscious of them, yet which are the components of conscious perceptual contents. This theory is best exemplified by the example, discussed in the *Préface* to the *Nouveaux Essais sur l'entendement humain*, of the perception of the noise of the sea which is composed out of the perception of the noise of each wave, in its turn composed of the insensible noise of each of its drops. Of course, Leibniz's theory is merely en epistemological one concerning perceptual contents, whereas the Medieval one under discussion has epistemological implications only insofar as it concerns the ontology of the sensible qualities of the "outside" natural world which are the causes of sensations in the external senses. Still, the way in which multiple imperceptible elements compose perceptible unities in both theories (perceptual contents in Leibniz's theory and actually perceptible sensible qualities in the Medieval theory under discussion) is remarkably similar.

[947] It should of course not be forgotten that many additional reasons contributed to the affirmation of this account in the central decades of the 14th century, not the least of them a changing understanding of the corruption of portions of the accidental and substantial forms of material substances, once separated from the whole to which they belong, by the containing medium. Indeed, although according to different models, both Walter Burley on the one hand and Buridan, Oresme and Albert of Saxony on the other hand challenged the instantaneity of such a process, therefore nuancing the very idea of an absolute 'threshold' of corruptibility of the sensible qualities of material substances. For a recapitulatory presentation of these developments, see below in the Conclusions.

Sensible qualities, as Jandun explicitly claims, echoing an intuition already foreshadowed by Roger Bacon, are better defined as what demarcates the "outside" world of material substances from what does not belong to the sublunary kingdom of matter and change. This is another remarkable statement, one that influenced in a decisive way all subsequent commentators discussed in this thesis. Importantly, it also shows that the changing understanding of sensible qualities in the Medieval Latin debate of the period ca. 1250-ca. 1350 had as a consequence a fundamental change, or at least a "complexification", of the Scholastic Aristotelian understanding of what nature itself is and what are its essential components. By 1350, the possession of sensible qualities, defined according to the new account I have sketched, certainly counted as one of them.

In addition to what I have said until now, I have shown throughout the thesis, especially in Chapter 2, that the place of the text of *De sensu* 6, 445b3-446a20 in the Medieval Latin debate of the period ca. 1250-ca. 1350 goes far beyond what can be ascertained by merely looking at commentaries explicitly devoted to it. Indeed, this text represents the only passage in the entire (extant) Aristotelian *corpus* where Aristotle explicitly discusses how the property of (potential) infinite divisibility of the (continuous) matter of material substances, intended as hylomorphic compounds, relates to the discrete structure of forms (both substantial and accidental ones). Therefore, and contrary to what has been claimed in recent literature, this text also fundamentally contributed to shape the debate (from Late Antiquity to the Latin Middle Ages) concerning the so-called issue of *minima naturalia*, that is, the issue of the divisibility of substantial forms through the (potential) infinite divisibility of the matter they inform. Although this issue is most prominently discussed by Aristotle in *Physics* I.4, in the context of a polemics against Anaxagoras, there it is not discussed in hylomorphic terms, and a discussion in hylomorphic terms comparable in its conceptual sharpness to the one provided for the accidental forms of sensible qualities in *De sensu* 6 is nowhere to be found in the other Aristotelian passages that came to be associated, in the commentary tradition, with the issue of *minima naturalia*. The possibility to provide a hylomorphic account of *minima naturalia*, which started to be developed already in Late Antiquity, especially thanks to John Philoponus' contribution, was therefore significantly indebted to the text of *De sensu* 6, 445b3-446a20.

Moreover, and more specifically, this text also fundamentally oriented the Latin debate on *minima naturalia* of the period ca. 1250-ca. 1350 in all its main stages, as I have shown thanks to a sustained analyses of a selection of Latin commentaries on *Physics* I.4 dating within the same period. Firstly, during the central decades of the 13th century, *De sensu* 6, 445b3-446a20 provided the key term that allowed Oxford commentators, most notably Geoffrey of Aspall, to develop an understanding of *minima naturalia* according to which, although substantial forms remain always present in portions of matter "physically" separated from the substance to which they belong, no matter how small, below a certain threshold of smallness they become unable to achieve their operations on the outside environment (in a more extreme form, they become unable to operate at all). Aspall labels this account that of *minima secundum actionem*, and (given also his explicit reference to *De sensu* 6, 445b3-446a20 in this context) it seems hard to deny that the origin of the name (and possibly the inspiration for the view) comes from the *translatio vetus* of *De sensu* 6, 445b3-446a20. In such translation, indeed, the entities Aristotle calls 'potentially sensible' are called 'sensible *virtute*', and those Aristotle labels 'actually sensible' are called 'sensible *actione*'. Although, of course, Aspall, as all the other Medieval Latin *De sensu* commentators relying on the *translatio vetus*, were not fooled by this peculiar choice of translation, they nonetheless took it as a source of legitimisation for a highly innovative and influential view of *minima naturalia*.

It is even more remarkable, then, that, especially during the second half of the 13th century, the text of *De sensu* 6, 445b3-446a20 (now available in William of Moerbeke's revision of the *translatio vetus*) provided the fundamental conceptual tool that allowed commentators active at the Parisian Faculty of Arts (such as the Pseudo-Siger of Brabant) to contrast the very same view of *minima secundum actionem*. Indeed, thanks to *De sensu* 6, 445b3-446a20, commentatos such as the Pseudo-Siger were able to orient the solution to the issue of *minima naturalia* around the two notions of parts existing potentially in a given whole and of parts existing in "physical" separation from it (something not even mentioned in the text of *Physics* I.4). According to the model provided by Aristotle in the text of *De sensu* 6, these commentators claimed that a part of a given substance, however small, insofar as it exists potentially within it, not only possesses its own substantial form, but also the ability to operate on the outside environment (and to achieve its operation) as part of the whole to which it belongs. If such a part were "physically" separated from

it, however, below a certain threshold of smallness it would not only lose the ability to operate (or even merely to achieve its operation), but it would lose its substantial form as well, being corrupted by the containing medium.

The reference to the containing medium is another fundamental aspect which clearly shows that the text of *De sensu* 6 played a crucial role in the Medieval Latin debate on *minima naturalia*. It was mainly thanks to this text (as sometimes explicitly recognised by commentators) that Medieval Latin commentators of *Physics* I.4 were able to bring into the discussion the role played by the corrupting action of the containing medium in the debate on *minima naturalia*. Indeed, as I have frequently noted, this aspect is entirely absent from *Physics* I.4. Moreover, this latter aspect turned out to be, in the long run, especially important, insofar as the Latin debate on *minima naturalia* of the first half of the 14th century centred around (and almost, in its most innovative trend, identified with) a discussion of the unfolding of the process of corruption of extremely small portions of material substances by the containing medium. This discussion, as I have shown, brought to the progressive vanishing of a meaningful notion of *minima naturalia*. Indeed, *Physics* commentators of the early 14th century, starting with Walter Burley and moving on to Nicole Oresme, John Buridan and Albert of Saxony, increasingly recognised the fact that the process of corruption by the containing medium of extremely small portions of a substance separeted from it (and, correlatively, also the process of corruption of substances as wholes) is a process that requires an extended interval of time. In Burley, this is the time required by the alteration of which corruption, according to his peculiar view, is the inclusive limit. In Oresme, however, and more explicitly in Buridan and Albert of Saxony, this is the time required by the successive corruption of any three-dimensionally extended portion of a substance. Indeed, according to these latter commentators, substantial forms (save for the intellective soul) are spatially extended entities having (actual) quantitative parts co-located with the parts of the matter they inform, and the corruption of such forms is the process by which first the outermost parts and then the innermost ones of the form of the portion of substance (or substance as a whole) considered are successively corrupted by the action of the containing medium (or of an external contrary agent more generally). In all these conceptions, insofar as the corruption of any given *minimum naturale* requires an extended interval of time, and insofar as such an interval of time is continuous and therefore (potentially) infinitely

divisible, it is always possible to identify a part of that same *minimum naturale* smaller than it that comes to exist on its own during the process of its corruption. This possibility makes the very notion of *minimum naturale* fundamentally meaningless[948].

All in all, therefore, the text of *De sensu* 6, 445b3-446a20 represents probably the crucial Aristotelian passage that allowed Medieval Latin commentators to develop a global (and mostly interconnected) account of a fundamental aspect of Scholastic Aristotelian hylomorphism, that is, what I have defined, in the general Introduction to the thesis, the aspect of the conditions of persistence of forms throughout the division of the matter of the hylomorphic compounds to which they belong. In this sense, the Medieval Latin debate on hylomorphic *minima* (where the predominant driving force is the discussion of *minima sensibilia*) is also a debate on the last frontiers and on the overall outlook of hylomorphism itself. This can already be seen by considering the fact that the reconstruction of the Medieval Latin debate on hylomorphic *minima* (ca. 1250-ca. 1350) that I have developed throughout Chapters 2-4 of the thesis has forced me to consider a number of topics which are absolutely crucial to Scholastic Aristotelian hylomorphism. To name but a few: instrumental causality, the relation between a form and its powers, the unfolding of substantial change, and the intension and remission of accidental forms. It would have been difficult to find another debate that could have brought all these aspects into play together.

The common "reagent" that allowed all these (and many more) aspects to emerge in the framework of a single overarching debate was, as I hope to have made aboundantly clear, the belief in the continuous structure of the matter of material substances (as an extended magnitude), and, as a consequence, in its (potential) infinite divisibility. As I have shown in Chapter 1, this belief is a fundamental one in Aristotle's own natural philosophy, featuring in a wide array of texts ranging from *Categories* 6, to *Metaphysics* Δ.6 and Δ.13, I.1 and K.12, to *Physics* V.3 and VI, especially VI.1-2, and *De generatione* I.2 and I.8. In most of these texts (all those where this aspect is thematised), this belief provides the fundamental ground to object to the atomists' conception of the natural world

[948] Of course, even on this view, as Oresme, Buridan and Albert of Saxony explicitly recognise (as Burley had done before them), the notion of *minimum naturale* still has a theoretical role to play, although a different one, namely, that of identifying the minimal quantity of a material substance that is capable to resist to the corrupting action of a containing medium of a given intensity and, therefore, to avoid being corrupted by it.

(that Aristotle evidently kept in high regard as the "main competitor" to his own natural philosophy), allowing him to develop a conception of the natural world centred on the idea that magnitudes are, in a relevant sense, mereologically simple, insofar as they do not have "actual" parts (this is, I believe, Aristotle's only true definition of the property of 'continuity'), until such parts are actualised by a process of division (intended as "physical" separation) in parts that are always further divisible. The belief in the continuity, and therefore in the (potential) infinite divisibility of magnitudes, and thus of the matter of material substances, fundamentally connotes the entire Aristotelian commentary tradition. Nevertheless, the importance of this belief in the overall natural philosophy of Scholastic Aristotelian masters is possibly even greater than the one it has in Late Ancient and in Islamic Aristotelian commentators. This is proved by the high degree of theoretical creativity and exegetical inventiveness Scholastic Aristotelian masters invested in order to fully understand and clarify this belief (although in progressively more diversified ways). Indeed, they systematically applied arguments drawn both from the geometrical and the logical tradition to supplement and to improve Aristotle's own mostly "physical" arguments, therefore fundamentally bridging the gap between three disciplines (logic, geometry and natural philosophy) that, in Aristotle's own works, were mostly independent from each other. Although, as seen, the use of geometrical arguments to discuss continuity and (potential) infinite divisibility is already present in Aristotle (albeit in a much more "embryonic" state), the use of logical tools in this context, and in particular of those of modal logic, is an entirely original creation of the Medieval Latin commentary tradition (one which finds only a distant precedent in Averroes). It is, remarkably, in the course of this process that Medieval Latin commentators provided an understanding of the property of continuity which was so interconnected with the property of (potential) infinite divisibility that, at times, some of these commentators explicitly took (potential) infinite divisibility to represent a definition of continuity alongisde Aristotle's own one of mereological simplicity. This progressive conceptual shift, therefore, put the Scholastic Aristotelian conception of the mereological structure of the entities of the natural world even more at odds (if it were possible) with any atomistic understanding of them.

As a result of the study conducted in this thesis, therefore, I am now in the position to definitively settle an issue that has been already addressed in the general Introduction.

Indeed, there I have recalled that the Medieval Latin debate on *minima naturalia* (and, consequently, on *minima sensibilia*) has frequently been taken by modern scholars to constitute an episode in the history of atomism. As I have stated there, and as I hope to have shown beyond doubt throughout the thesis, this is absolutely not the case, although, of course, the connection between the two aspects (and the awareness of this connection by Medieval Latin masters) cannot be denied. What is fundamental to underline here is that, however, the Medieval Latin debate on *minima naturalia* and on *minima sensibilia* arose exactly at the confluence between continuity and discreteness. It is only by conflating a "divisibilist" stance concerning matter and an "indivisibilist" stance concerning forms that the debate on hylomorphic *minima* emerged and blossomed in the Medieval Latin world. In this sense, the debate on hylomorphic *minima* represents a focal point, or even better the vanishing point, of the Scholastic Aristotelian understanding of the "outside" natural world, one which is structured exactly by the conjunction of continuity and discreteness. It is in this debate that this conjunction is explicitly thematised, and, as a result, it becomes impossible to consider this debate independently from all the escape lines represented by the most important assumptions made in Scholastic Aristotelianism concerning matter, form, and change. It is therefore my hope to have contributed, with this thesis, to increase our knowledge not only of the Scholastic Aristotelian debate on *minima*, but also, more generally, of Scholastic Aristotelian hylomorphism as a whole.

APPENDIX

A Provisional Inventory of Latin *De sensu* Commentaries (13th-15th Centuries)

Criteria of Composition

The inventory focuses on manuscripts dated between the 13th and the 15th century containing attributed and anonymous commentaries on the *De sensu*, so as to provide an inventory of them which purports, at the present state of research, to be as exhaustive as possible. It does not include manuscripts merely reporting glosses, *indices*, *capitula*, or *auctoritates Aristotelis* referring to the *De sensu*, unless their contents exhibit a direct connection to commentaries listed in the inventory[949]. The same, as a rule, goes for

[949] I have, however, conducted a preliminary survey concerning glosses. Thanks to the same repertories consulted in order to build the inventory (on which see below) I have identified three different sets of attributed glosses to the text of the *De sensu* (either in the *translatio vetus* or in the *translatio nova*) dating between the 13th and the 15th century. They are the glosses attributed to Henry of Renham (possibly a student of Adam of Buckfield, and in any case active in the mid-13th century), which are preserved in London, British Museum, Royal 12.G.II (second half of the 13th century), ff. 382v-397r, those attributed to Adam of Whitby, also active at Oxford around the mid-13th century, which are preserved in mss. Firenze, Biblioteca Nazionale Centrale, Fondo Conv. Soppr. G.3.464 (14th century), ff. 73v-78r (anonymous), München, Bayerische Staatsbibliothek, Clm. 14522 (second half of the 14th century), ff. 149-155v, and Paris, Bibliothèque nationale de France, Lat. 16149 (13th century), ff. 62r-67v, and, finally, those maybe to be attributed to John Peilicke de Żytyce, a Cracovian master of the 15th century, preserved in ms. Kraków, Biblioteka Jagiellońska, 512 (1496-1497), ff. 55r-87r. To these, one should add an imposing number of anonymous glosses to the text of the *De sensu* (either in the *translatio vetus* or in the *translatio nova*) dating between the 13th and the 15th century. I have identified, so far, at least 196 manuscripts that could contain such glosses, thanks to a consultation of the two volumes of *Codices* of the *Aristoteles Latinus* and of their three *Supplements* (cf. *Aristoteles Latinus. Codices: Pars Prior,* codices descripsit G. LACOMBE, in societatem operis adsumptis A. BIRKENMAJER, M. DULONG AET. FRANCESHINI, Roma 1939, *Aristoteles Latinus. Codices: Pars Posterior et Supplementa*, codices descripsit G. LACOMBE, in societatem operis adsumpsit A. BIRKENMAJER, M. DULONG, AET. FRANCESCHINI, supplementis indicibusque instruxit L. MINIO-PALUELLO, Cambridge 1955, *Aristoteles Latinus. Codices: Supplementa altera*, ed. L. Minio-Paluello, Bruges 1961, and the draft version of *Aristoteles Latinus. Codices: Supplementa tertia*, under the editorial supervision of Pieter Beullens, available online at https://zenodo.org/record/7111413#.Y3oISy1aaL0, 2021, last consulted on January 31st, 2023, which lists the new findings emerged since the publication of the *Supplementa altera* in 1961). Of course, also given the fact that the relevant volumes of the *Aristoteles Latinus* do not always report precise information on the glosses contained in the manuscripts listed, only a direct examination of all the manuscripts could allow to draw some inferences concerning this important aspect of the Latin reception of the *De sensu*. Some work in this direction has been performed by Griet Galle concerning the manuscripts reporting the so-called 'Oxford gloss' on the *De sensu*, whose composition can be dated around the mid-13th century and which shows important elements of contact with the commentaries attributed to Adam of Buckfield and to his circle. Cf. especially G. GALLE, "Edition and Discussion of the Oxford Gloss on *De Sensu* 1", *op. cit.*, and EAD., *Interpretations of the* Translatio Vetus *of* De sensu *I in Commentaries Attributed to Adam of Buckfield and in the Oxford Gloss, op. cit.*

abbreviations, *dicta* and *compendia* of the *De sensu* (the most notable case in point being John Krosbein's late 14th-century *Compendium* of the *De sensu*). I have, however, as a rule included collections of *Puncta* and of *quaestiones non disputatae* on the *De sensu*. Indeed, most of them date to the late 14th and to the 15th century, and they show a close connection (normally explicitly acknowledged) to the previous and contemporary Parisian commentary tradition on the *De sensu* (they are frequently drawn from Buridan's, Marsilius of Inghen's and John Versoris' *De sensu* commentaries). In this sense, at the very least, they represent a significant help to reconstruct the contents and doctrines of such commentary tradition. Moreover, I have also, as a rule, included collections of *problemata* on the *De sensu*, whether or not they are accompanied by any other form of commentary on the text. True, they frequently show a stronger connection with the previous and contemporary medical literature than with the previous and contemporary commentary tradition on the *De sensu*. Nonetheless, since the late 14th century, when they started to appear together with, or instead of, proper commentaries on the *De sensu*, they came to constitute one of the main ways (and a distinctive one) *magistri artium* used to approach the text of the *De sensu*.

The repertories consulted in order to build this inventory are listed at the end of the inventory itself. Among the available repertories listing manuscripts preserving Medieval Latin commentaries on Aristotle, there are only two thematic ones (i.e., repertories listing exclusively commentaries on some of the *Parva naturalia* – no repertory listing exclusively commentaries on the *De sensu* is availbale for the period at hand). They are the preliminary inventory made by Jozef de Raedemaeker in the 1960s, based on the archive of manuscripts on microfilm available at the De Wulf-Mansion Centre of KU Leuven[950], and the much more recent catalogue elaborated by Sten Ebbesen, Christina Thomsen Thörnqvist and Véronique Decaix[951]. None of the two repertories can be considered exhaustive, and the list of manuscripts I present is much richer than both. In the case of the catalogue by Ebbesen, Thomsen Thörnqvist and Decaix, this is obvious, since the authors merely focus on the period ca. 1260-ca. 1320 (however, even for this specific period, the inventory I present makes some progress on

[950] Cf. J. DE RAEDEMAKER, "Une ébauche de catalogue des commentaires sur les *Parva naturalia* parus aux XIIIe, XIVe et XVe siècles", *Bulletin de philosophie médiévale* 7, 1965, pp. 95-108.
[951] Cf. S. EBBESEN, C. THOMSEN THÖRNQVIST, V. DECAIX, "Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue", *Bulletin de philosophie médiévale* 57, 2015, pp. 59-115.

that catalogue, both in terms of the addition of new manuscripts and of the attribution of manuscripts that, in that catalogue, were considered anonymous). In the case of the inventory by de Raedemaeker, the situation is different. The author, indeed, purported to cover the entire period from the 13th to the 15th century, yet the pieces of information available at his time were much more limited than the ones available nowadays, so that my inventory lists many more manuscripts than those listed by de Raedemaeker. Significantly, moreover, in a good number of cases de Raedemaeker only indicated that a given manuscript contained commentaries on the *Parva naturalia*, without specifying which texts were covered: I have clarified all such ambiguous cases for what concerns specifically the *De sensu*. Apart from these two thematic repertories, I have based my inventory on all the available repertories focused on authors (i.e., repertories listing manuscripts preserving Medieval Latin commentaries on Aristotle for specific authors) or geographic areas (i.e., repertories listing manuscripts preserving Medieval Latin commentaries on Aristotle for specific libraries, regions or countries). Among them, the most prominent place is evidently occupied by Charles Lohr's monumental repertory of attributed Medieval Latin commentaries on Aristotle, which I have consulted in the new version that has been published a few years ago[952]. The other similar work that deserves mention is Olga Weijers' repertory of commentaries ascribed to Medieval *magistri artium* active at the Parisian Faculty of Arts or in any case connected to it[953]. Evidently, however, even these repertories could provide only a partial basis for my inventory, since they only

[952] Cf. C.H. LOHR, *Latin Aristotle Commentaries I.1. Medieval Authors. A-L (Corpus Philosophorum Medii Aevi. Subsidia 17)*, Firenze, SISMEL-Edizioni del Galluzzo, 2013, and ID., with the help of C. COLOMBA, *Latin Aristotle Commentaries I.2. Medieval Authors. M-Z (Corpus Philosophorum Medii Aevi. Subsidia 18)*, Firenze, SISMEL-Edizioni del Galluzzo, 2010.

[953] Cf. O. WEIJERS, *Le Travail intellectuel à la Faculté des Arts de Paris : textes et maîtres (ca. 1200-1500), Répertoire des noms commençant par A-B (Studia artistarum 1)*, Turnhout, Brepols, 1994; EAD., *Le Travail intellectuel à la Faculté des Arts de Paris : textes et maîtres (ca. 1200-1500), Répertoire des noms commençant par C-F (Studia artistarum 3)*, Turnhout, Brepols, 1996; EAD., *Le Travail intellectuel à la Faculté des Arts de Paris : textes et maîtres (ca. 1200-1500), Répertoire des noms commençant par G (Studia artistarum 6)*, Turnhout, Brepols, 1999; EAD., *Le Travail intellectuel à la Faculté des Arts de Paris : textes et maîtres (ca. 1200-1500), Répertoire des noms commençant par H et J (jusque Johannes C) (Studia artistarum 9)*, Turnhout, Brepols, 2001; EAD., *Le Travail intellectuel à la Faculté des Arts de Paris : textes et maîtres (ca. 1200–1500), Répertoire des noms commençant par J (suite à partir de Johannes D.) (Studia artistarum 15)*, Turnhout, Brepols, 2003; O. WEIJERS, M. CALMA, *Le Travail intellectuel à la Faculté des Arts de Paris : textes et maîtres (ca. 1200-1500), Répertoire des noms commençant par P (Studia artistarum 7)*, Turnhout, Brepols, 2008; EAED., *Le Travail intellectuel à la Faculté des Arts de Paris : textes et maîtres (ca. 1200-1500), Répertoire des noms commençant par R (Studia artistarum 25)*, Turnhout, Brepols, 2010; EAED., *Le Travail intellectuel à la Faculté des Arts de Paris : textes et maîtres (ca. 1200-1500), Répertoire des noms commençant par S-Z (Studia artistarum 33)*, Turnhout, Brepols, 2012.

list manuscripts reporting attributed commentaries (and even in these cases, they overlook some relevant items), whereas, as my inventory will show, roughly half of the known Medieval Latin commentaries on the *De sensu* are anonymous works. For information on manuscripts preserving the latter, I have mostly depended upon the other repertories listed in the final bibliography (most of them due to the tireless and commendable work conducted in the last decades by Myeczislaw Markowski). Whenever possible, however, I have tried to supplement the information provided by these repertories with that available in the relevant library catalogues (which, nevertheless, as a rule is much less detailed concerning the contents of the manuscripts) and on information provided on the relevant libraries' websites or by librarians themselves. Whenever possible, I have consulted the manuscripts directly. Yet, much remains to be done in this respect. Therefore, I hope to be able to present a much more complete and detailed inventory once I will have been able to consult directly all (or most) of the manuscripts listed in the inventory.

In cases of discrepancies between repertories, when the manuscript could not be consulted directly, the information included in the most recent (and/or most detailed) repertory has been preferred. When, in the case of late 15th-century commentaries, only printed editions are extant, but no manuscripts, this has been duly noted, and the reference to the *editio princeps* has been provided. References to manuscripts included in past catalogues but no longer extant have been omitted.

Note that I only classify the commentaries listed as ‘literal’ ones and ‘question’ ones for reasons of clarity and expediency. Yet, when indicating the title of the commentaries, I always specify whether the commentary is a mere *expositio* or collection of *quaestiones*, or whether it belongs to a specific "sub-genre" of one of these two macro-genres (e.g., *problemata*, which are always listed under question commentaries). Whenever I have not been able to consult the manuscript directly, and the available repertories give a foliation referring to all of the commentaries to the *Parva naturalia* included in the manuscript, without specifically referring to the *De sensu*, the foliation has been included but this fact has been duly noted. Whenever I have not been able to consult the manuscript directly, and no foliation is reported in the available repertories, I have just indicated the position of the commentary among the items contained in the manuscript.

Note that for every commentary listed I first provide a title of the work (given according to the revised version of Charles Lohr's repertory, or to the critical edition of the commentary, whenever available, or otherwise according to the main repertory where the commentary is mentioned), followed by the *incipit* and *explicit* of the work and by a list of all its known manuscript witnesses. The *incipit* and the *explicit* of attributed commentaries preserved in more than one manuscript witness (or in a single manuscript witness which, however, I have not been able to consult), unless otherwise indicated, are those included by Lohr in the revised edition of his repertory. If, however, one or more of the manuscript witnesses of a given commentary present a significantly different *incipit* and/or *explicit* from the one indicated in Lohr's repertory (or in the other repertory from which it is taken), I include it in a footnote. If, moreover, no *incipit* or *explicit* is listed in available repertories, and if the manuscript witnesses of the work present significant differences in their *incipit* and/or *explicit*, I list each of them under each manuscript witness, without including one of them under the title of the work (whenever I proceed in this way, this has been duly noted). For anonymous commentaries, I always include the *incipit* and *explicit* of the manuscript witness (or witnesses) of each commentary. Whenever a critical edition of the commentary is available (or even a preliminary version of it), of course, the *incipit* and the *explicit* provided are those of the edition itself. The bibliographic reference to the critical edition of a commentary is included after the *incipit* and the *explicit* of the commentary itself and before the list of the manuscript witnesses of the commentary itself. Note as well that, whenever quoting directly from the manuscripts, I have preserved the orthographic peculiarities of the original, but I have established the punctuation according to standard modern usage (according to the criteria I have followed throughout the thesis).

The inventory is organised as follows: first I list all attributed commentaries, dividing them in literal and question ones. Note that I include both attributions that are found in the manuscripts themselves, regardless of whether they have been formulated by the same hand writing the text or not, and attributions that have been suggested in secondary literature. In both cases, whenever the attribution, in contemporary scholarship, is considered as unlikely or significantly disputed, I accompany it with a question mark between parentheses: '(?)'. In any case, I always note which manuscript

witnesses preserve attributions of a commentary. Afterwards, I list all anonymous commentaries, dividing them in literal and question ones.

I have marked with the symbol '†' all the manuscripts that I have consulted directly, either *in situ* or through digital images.

Attributed Commentaries

A. Literal Commentaries

1. Adam de Buckfield (ca. 1220-1279/1292)

a. *In De sensu et sensato (Recensio I)*[954]

Incipit[955]: "Cum intencio phisici secundum quod phisicus sit determinare de anima secundum quod est actus corporis".

Explicit: "sicut facit in libro *De memoria et reminiscencia* et sic terminatur iste totalis liber."

Colophon: "Expliciunt notule *De sensu et sensato* a magistro A. de Bocfelde".

MSS:

- † Madrid, Biblioteca Nacional, 3314 (mid-13th century), ff. 100r-110r (anonymous).
- † Milano, Biblioteca Ambrosiana, H.105.Inf. (13th-14th century), ff. 1r-18r (anonymous, incomplete at beginning).
- Oxford, Balliol College, 313 (late 13th century), ff. 132r-144v.
- Philadelphia, Free Library, Lewis European 53 (ca. 1250-1280), ff. 52r-57v (anonymous).

b. *Abbreviationes* of *Recensio I*

Given the differences between the text of the two manuscript witnesses of the *abbreviationes* of the *recensio I* of Buckfield's commentary, I provide the *incipit* and (when possible) also the *explicit* of each of them separately below.

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[954] On Buckfield's (and his circles') *De sensu* commentaries, see especially G. GALLE, "Edition and Discussion of the Oxford Gloss on *De Sensu* 1", *op. cit.*, EAD., *Interpretations of the* Translatio Vetus *of* De sensu *I in Commentaries Attributed to Adam of Buckfield and in the Oxford Gloss, op. cit.*, and, more recently, G. GALLE, "The Order of the *Parva naturalia* in Three Commentaries on *De sensu* Associated with Adam of Bockenfield: Implications for the Authenticity Question", *Micrologus* XXXI/bis, forthcoming. The classification of the various *recensiones* of Buckfield's commentary is based on GALLE, "Edition and Discussion of the Oxford Gloss on *De Sensu* 1", *op. cit*. The first *recensio* "is a detailed analysis of Aristotle's text, with a number of digressions and *dubitationes*" (*ibid*., p. 205). In contrast to it, the second *recensio* "gives an analysis of the text that is much shorter than the analysis in *recensio 1*. His [i.e., of the author] exposition reconstructs the conceptual content of the text and does not discuss the details of the *littera* of the text" (*ibid*., p. 207). Finally, the third *recensio* "offers [like the first one] a detailed analysis and interpretation of *De sensu*, but it also contains *questiones* (about the problems discussed in digressions in r*ecensio 1*)" (*ibidem*). Galle's studies supersede the classification of the *recensiones* of Buckfield's (and his circle's) commentaries in THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, ed. GAUTHIER, *op. cit.*, pp. 117*-120*.

[955] The *incipit*, the *explicit* and the *colophon* are given according to those found in ms. Oxford, Balliol College, 313.

MSS:

- Cambridge, Gonville and Caius College, 384 (506) (13th century), ff. 282r-293v. Incipit: "Cum intencio naturalis philosophi sit determinare de anima secundum quod est actus corporis" (anonymous, *translatio vetus* with long passages of comment in all the lower margins, with lemmata)[956].
- Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 4° 312 (ca. 1323, or mid-13th century, for the part of the manuscript containing, among others, the *De sensu* commentary[957]), ff. 69v-73v (anonymous)[958].
  Incipit: "Cum in libro *De anima* determinavit de sensu et sensato sive sensibili".
  Explicit: "primo considerare de memoria et memorari. Deo gracias."

c. *In De sensu et sensato (Recensio II)*[959]

Incipit[960]: "Incipit scriptum in librum *De sensu et sensato*. <*Q*>*uoniam autem de anima* etc. Finito libro *De anima*, in quo determinavit Aristoteles de anima secundum se et de partibus et de potentiis anime, in hoc libro et in sequentibus, qui alternantur libro *De anima*, determinat de proprietatibus consequentibus ad principales operationes partium anime".

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[956] Although the commentary, being only written in the margins (specifically in the inferior margin, and thus properly representing a set of glosses, should not be listed in the inventory, I have included it in order to give a more complete picture of all the witnesses of Buckfield's commentaries on the *De sensu*. Nevertheless, throughout the thesis I do not consider this commentary as an item of the inventory in its own right. Note that the manuscript also reports the Oxford gloss on the *De sensu* in the margins (cf. GALLE, "Edition and Discussion of the Oxford Gloss on *De sensu* 1", *op. cit.*, pp. 205-206).

[957] The dating of the manuscript (or, more precisely, of the first portion of it, including the ff. 69-73) is controversial. As Galle notes (cf. GALLE, "Edition and Discussion of the Oxford Gloss on *De sensu* 1", *op. cit.*, p. 206): "According to the description given by R. Wood [*Introduction* by R. WOOD, in RICHARD RUFUS OF CORNWALL, *In Physicam Aristotelis (Auctores britannici medii aevi 16)*, ed. R. WOOD, Oxford, Oxford University Press, 2003, pp 29-41], the anonymous commentary on *De sensu* belongs to manuscript A of Q. 312. It is part of what she calls the «Ave Maria Aristotle quires», which mainly include Aristotle commentaries. The top of the first page of each quire, nine of which are present in Q. 312 and seven in Q. 290, mentions a few words of the 'Ave Maria'. The quires were copied in Oxford, sometimes before 1250 according to R. Rouse (stated in a letter to R. Wood); in R. Wood's opinion they were copied «on the early side of the thirteenth century», ca. 1240. If this dating is correct, it provides us with a *terminus ante quem* for the composition of the first version of Bocfeld's commentary."

[958] The recognition that the text represents an anonymous *abbreviatio* of *recensio I* of Buckfield's commentary is due to Galle (cf. GALLE, "Edition and Discussion of the Oxford Gloss on *De sensu* 1", *op. cit.*, p. 206). As Galle notes (*ibid*., n. 35: "In his catalogue of the Amplonian collection of Erfurt (written between 1410 and 1421), Amplonius Ratinck de Bercka wrongly attributed most works [in this ms.] to the commentator Walter Burley, including the commentary on *De sensu*. See the edition of the catalogue by Amplonius, in P. LEHMANN (ed.), *Mittelalterliche Bibliothekskataloge Deutschlands und der Schweiz*, II, München, 1928, p. 37, n. 42: «Item volumen bonum, in quo sunt subscripta: [...] summarie divisiones et sentencie Burley super 3 libris de anima; super libello de memoria et reminiscencia; super libris de sensu et sensato; [...]». [...]."

[959] The *recensio II* of Buckfield's commentary on *De sensu* 7 has been edited in J. TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 150-173.

[960] The *incipit* and the *explicit* are given according to those found in ms. London, Wellcome Historical Medical Library, 3.

Explicit: "ultimo addit intentionem respectu libri *De memoria et reminiscentia* qui immediate sequitur istum et hoc est *Reliquorum autem*. Explicit scriptum *De sensu et sensato*."

MSS:

- † Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 5988 (second half of the 13th century), ff. 34r-41v (anonymous).
- Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° F.318 (late 13th-early 14th century), ff. 150ra-161ra (anonymous)[961].
- † London, Wellcome Historical Medical Library, 3 (ca. 1300), ff. 53v-60r (anonymous).

d. *In De sensu et sensato* (*Recensio III*)

Colophon: "Scriptum magistri Adam anglici litterale super librum *De sensu et sensato* Aristotilis. Explicit".

MSS:

- † Lisboa, Biblioteca Nacional, Alcobaça 179 (*olim* Coimbra 382) (mid-13th century), ff. 126v-141r.

2. Albertus Magnus (ca. 1200-1280)

De sensu et sensato cuius secundus liber est De memoria et reminiscentia

Incipit: "*Quoniam autem de anima secundum ipsam* considerata iam in libro *De anima determinatum est*, in quo etiam libro *de qualibet virtute* diximus quae *secundum partem* potentialem animae principaliter esse dicitur, et determinata sunt opera propria vegetabilis et obiectum, quae sunt magis corporalia inter opera animae, *consequens erit facere considerationem de* naturis *animalium,* quorum ipsa anima est principium et causa et ratio et substantia, *et* sic tractandum est de *omnibus vitam habentibus* propter easdem causas".

Explicit: "Igitur *de instrumentis* quae dicuntur sensuum organa *et* de ipsis *sensibilibus, quomodo se habeant* tam organa secundum se quam sensibilia secundum se, et quomodo singulariter *et communiter* ad sensum relata, *et* quomodo se habent singulariter *secundum unumquodque* organum sensus, *sit* hoc modo a nobis determinatum. Sufficiunt enim ista cum his quae in libro *De anima* sunt considerata."

Colophon: "Explicit liber primus *De sensu et sensato*".

[961] Expl.: "unde recapitulat determinata in tercio libro et ultimo. Addit determinata in libro *De memoria et reminiscencia*: *Et hoc est reliquorum* etc."

Editio critica: ALBERTUS MAGNUS, *Alberti Magni Ordinis Fratrum Praedicatorum De nutrimento et nutrito. De sensu et sensato cuius secundus liber est De memoria et reminiscentia (Alberti Magni Opera Omnia, Editio Coloniensis, Tomus VII Pars II.A)*, ed. S. DONATI, 2017, Münster i.W., Aschendorff Verlag.

MSS[962]:

- Bologna, Biblioteca Comunale dell'Archiginnasio, 953 (15th century), ff. 56r-82r.
- Bruxelles, Bibliothèque Royale, 1192-1207 (1417), ff. 149r-189v.
- Cambridge, Gonville and Caius College, 385 (507) (15th century), ff. 96r-116v; 117r-v; 118r-v.
- Cambridge, Peterhouse, 161 (15th century), ff. 30r-69r.
- Chantilly, Musée Condé, 327 (642) (14th-15th century), ff. 217r-266r.
- Città del Vaticano, Biblioteca Apostolica Vaticana, Borgh. 134 (before 1316), ff. 185r-217r.
- Città del Vaticano, Biblioteca Apostolica Vaticana, Ott. Lat. 2074 (second half of the 15th century), ff. 236r-258r (incomplete).
- Città del Vaticano, Biblioteca Apostolica Vaticana, Urb. Lat. 194 (175) (15th century), ff. 204r-237v.
- Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 6759 (14th century), ff. 183r-219r.
- Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 11612 (15th century), ff. 40r-66r.
- Clermont-Ferrand, Bibliothèque Municipale, 171 (151) (13th century), ff. 2r-20r.
- Erfurt, Universitätsbibliothek, Dep. Erf. CA 2°, 328 (end of the 13th-beginning of the 14th century), ff. 100r-122r.
- Erlangen, Universitätsbibliothek, 204 (Irmischer 169) (14th century), ff. 1r-21r.
- Evora, Biblioteca Publica, CXXV/2-21 (15th century), ff. 1r-12v; 13r (incomplete).
- Firenze, Biblioteca Medicea Laurenziana, Plut. 83.1 (15th century), ff. 54r-76v.
- Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. J.3.20 (14th-15th century), ff. 25r-54v.
- Leipzig, Universitätsbibliothek, 1401 (first quarter of the 14th century for the ff. 1-156, first half of the 14th century for the ff. 157-261, first quarter of the 14th century for the ff. 262-371), ff. 97r-122v.
- Lilienfeld, Stiftsbibliothek, 205 (13th century), ff. 30r-55v.
- München, Bayerische Staatsbibliothek, Clm. 993 (15th century), ff. 127v-170r.
- Oxford, Bodleian Library, 141 (mid-15th century), ff. 72r-119r.
- Oxford, Bodleian Library, Laud. Misc. 628 (end of the 13th-beginning of the 14th century), ff. 113v-137v.
- Oxford, Merton College, 285 (O.2.1) (mid-14th century), ff. 221r-230v.
- Oxford, New College, 229 (end of the 13th-beginning of the 14th century), ff. 238r-261r.
- Paris, Bibliothèque Nationale de France, Lat. 6512 (14th century), ff. 203v-228r.
- Paris, Bibliothèque Nationale de France, Lat. 6523 (15th century), ff. 99r-122v.

[962] Note that I have not listed manuscripts containing only Albert's *De memoria*, but not his *De sensu*. The foliation given refers only to Albert's *De sensu*.

- Paris, Bibliothèque Nationale de France, Lat. 6524 (end of the 14th century), ff. 58v-65v (merely excerpts).
- Paris, Bibliothèque Nationale de France, Lat. 14729 (15th century), ff. 187v-252v.
- Pisa, Biblioteca del Seminario Arcivescovile di Santa Caterina, 12 (first half of the 14th century), ff. 141r-165bisr.
- Pommersfelden, Gräflich Schönbornsche Schloßbibliothek, 103 (13th century), ff. 76v-99r.
- Saint-Omer, Bibliothèque Municipale, 601 (end of the 13th-beginning of the 14th century), ff. 1r-26r.
- Saint-Omer, Bibliothèque Municipale, 606 (15th century), ff. 261r-304v.
- Salamanca, Biblioteca Universitaria, 1786 (*olim* Madrid, Palacio Real, 185) (15th century), ff. 23v-61v.
- Sevilla, Biblioteca Capitular y Colombina, 56-6-19 (*olim* 82-7-14) (before 1488), ff. 108r-133v (incomplete).
- 's-Gravenhage, Rijksmuseum Meermanno-Westreenianum, 10.A.9 (14th-15th century), ff. 41r-63r.
- Stockholm, Kungliga Bibliotek, X.528 (1467/1468), ff. 207r-220r (merely excerpts).
- Strasbourg, Bibliothèque Nationale et Universitaire, 55 (latin 53) (1422-1424), ff. 57r-75r (incomplete).
- Valenciennes, Bibliothèque Municipale, 952 (700) (15th century), ff. 228r-290r.
- Venezia, Biblioteca Nazionale Marciana, Lat. Z.290 (1936) (15th century), ff. 85r-113v.
- Venezia, Biblioteca Nazionale Marciana, Lat. VI.24 (2808) (1443/1444), ff. 315r-341r.
- Venezia, Biblioteca Nazionale Marciana, Lat. VI.17 (2543) (14th century), ff. 75v-95r.
- Venezia, Biblioteca Nazionale Marciana, Lat. VI.20 (3063) (14th century), ff. 63r-68v.
- Venezia, Biblioteca Nazionale Marciana, Lat. VI.257 (2535) (14th century), ff. 97r-125r.
- Wien, Österreichische Nationalbibliothek, 2292 (mid-14th century), ff. 102r-114r.
- Zwettl, Stiftsbibliothek, 56 (first quarter of the 14th century for the ff. 1-107, probably end of the 13th century for the ff. 108-335), ff. 243r-263r.

3. Gotschalkus de Hagen (early 15th century)

In libros Parvorum naturalium **(including *De sensu*)**

MSS:

- München, Bayerische Staatsbibliothek, Clm. 429 (1427), item 2.

4. Gualterus Burlaeus (ca. 1275-1344)

***Expositio libri De sensu et sensato*[963]**

Incipit: "*Quoniam autem de anima* et cetera. Scientia de anima in tres partes distinguitur, nam una est de anima secundum se et de potentiis et partibus animae per comparationem ad animam".

Explicit: "sed impossibile est idem simul et semel moveri motibus contrariis; igitur impossibile est eundem sensum simul immutari a contrariis[964]."

Editio critica (preliminary text): GUALTERUS BURLAEUS, *Commentarium in De sensu et sensato Aristotelis*, ed. M. MANSFELD, forthcoming.

MSS:

- Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2151 (14th century), ff. 244r-256r.
- London, British Museum, Lambeth Palace 74 (1390 and 1391), ff. 175r-184v[965].
- Oxford, Magdalen College, Lat. 146 (14th-15th century), ff. 95r-104v.
- Oxford, Oriel College, 12 (15th century; kept in the Bodleian Library), ff. 86v-99.
- Pamplona, Biblioteca de la Catedral, 24, ff. 175v-192v (incomplete at beginning).

5. Jacobus Faber Stapulensis (Jacques Lefèvre d'Étaples) (ca. 1450/1455-1536)

***Totius philosophiae naturalis paraphrases* (including *De sensu*)**

MSS:

- Editio princeps: Paris 1492.

[963] A critical edition, as said, is currently being prepared by a member of Marek Gensler's research group at the University of Łódź (Monika Mansfeld) in the framework of a project aimed at the edition of Walter Burley's *expositio* of the whole *Parva naturalia*. For what concerns the manuscript witnesses of Burley's *Expositio*, see also, apart from the general repertories of Aristotelian commentaries listed in bibliography, J.A. WEISHEIPL, "Repertorium Mertonense", *Mediaeval Studies* 31 (1), 1969, pp. 174-224, p. 202. Moreover, note that a table of contents on f. 6v of ms. Oxford, Merton College, 261 (C.2.12) (end of the 13th century), lists also, after the sixth item in the manuscript, a commentary by Burley on *De longitudine et brevitate vitae* and another one on the *De sensu*. Nothing of the sort, however, can be found in the contents of the manuscript.

[964] The *incipit* and *explicit* of the work are indicated according to Monika Mansfeld's preliminary edition of the text.

[965] Concerning the origin of the ms., cf. P. ROBINSON, *Catalogue of Medieval Manuscripts of Latin Commentaries on Aristotle in British Libraries. Vol. III: Aberdeen and York*, Turnhout, Brepols, 2020, p. 204: "Colour of parchment and style of initials suggest Oxford origin."

6. Ioannes Aurifaber (late 14th century)[966] (?)

Expositio in librum De sensu et sensato

Incipit[967]: "Queritur utrum de operationibus anime que enumeratur (?) in littera possit esse sciencia. Videtur quod non".

Explicit: "quod unius rei unus est intellectus, dicendum, quod unum est unius rei, in racione unius est intellectus. Et sic est finis, adest laus et cetera."

MSS:

- † Leipzig, Universitätsbibliothek, 1423 (1458), ff. 371v-383v.

7. Ioannes Buridanus (ca. 1300-ca. 1361)

***Expositio libri De sensu et sensato*[968]**

Incipit: "*Quoniam*. Iste liber, quem vocamus *De sensu et sensato*, dividitur, quia primo Aristoteles premit<t>it intencionem suam et quedam hic supponenda ex libro *De anima*".

Explicit: "quod de sensiteriis, i.e. de organis sensitivis et de sensibus iam sic determinatum est. Ideo posterius restat determinare *De memoria et reminiscencia* et *De sompno et vigilia*. Explicit liber *De sensu et sensato*."

MSS:

- † Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2162 (14th century), ff. 141v-149r.
- † Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° F.298 (after 1352), ff. 122ra-126vb.
- † Firenze, Biblioteca Medicea Laurenziana, Ashb. 1348, ff. 115r-121v (anonymous; very likely a different *recensio*, possibly not by Buridan[969]).

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[966] Not to be confused with the other John Aurifaber who lived between the 13th and the 14th century. The Aurifaber to whom a *De sensu* commentary is ascribed is the pupil of Laurentius Londorius who became *magister artium* in Paris in 1397.

[967] The *incipit* and *explicit* are given according to those of the only known manuscript witness of the commentary.

[968] The text of the *Expositio* dealing with *De sensu* 7 (the eigth chapter of the commentary) has been edited (only using the Vatican and the Erfurt manuscripts) in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 209-216.

[969] On the relation between the text of the *Expositio* on the *De sensu* contained in this manuscript and Buridan's *Expositio* as contained in the Erfurt and Vatican manuscripts, cf. *supra*, Chapter 4, and especially n. 903. As I have said there, the text of the *Expositio* contained in the Florentine manuscript is probably best classified as a "re-worked" summary of Buridan's *Expositio*, whose attribution to Buridan himself remains very doubtful. Nevertheless, pending further researches on the text, I list here together with the two sure witnesses of Buridan's *Expositio* on the *De sensu*.

8. Ioannes Hulshot (Hultshout; Hulshout) de Mechlinia (d. 1489)

***Textus Parvorum naturalium Aristotelis cum commentario clarissimo secundum doctrinam Alberti magni Episcopi Ratisponensis* (including *De sensu*)**

Incipit (*De sensu*): "*Quoniam autem de anima*. Iste est liber *De sensu et sensato* qui primus est inter eos qui dicuntur *De parvis naturalibus*, qui et annexi sunt libro *De anima*, disponentes ad ea, que dicenda sunt in libris *De vegetabilibus et plantis* et *De animalibus*. Et dividitur prima sui divisione in partem proemialem et executivam, que incipit ibi".

Explicit: "propriam speciem sensibilem in sensu."

MSS:

- Editio princeps: Köln 1491[970].

9. Ioannes Tinctoris de Tornaco (ca. 1405/1410-1469)

***Copulata De sensu et sensato*[971]**

Incipit: "Incipiunt *Copulata de sensu et sensato* magistri prenominati (?)[972]. Necessaria est consideratio eorum que in hoc libro tractantur; probat Philosophus quia in hoc libro determinat de his que pertinent ad animalia et plantas, sive sint communia omnium vel plurium, sive sint propria".

Explicit: "est sensibile et indivisibile. Est epylogus dictorum. Explicit liber (?) *De sensu et sensato*. Incipit *De memoria et reminiscentia*."

[970] Note that some of the commentaries to the *Parva naturalia* in this edition, although being attributed to Ioannes, are those by Jacobus Tymens de Amersfordia (they are those to the *De iuventute et senectute*, *De respiratione*, *De morte et vita*, and *De motibus animalium*) (cf. LOHR, *Latin Aristotle Commentaries I.1. Medieval Authors. A-L, op. cit.*, pp. 296-297).

[971] Note that this commentary, as all the standard 15th-century *copulata*, a literary genre whose origin seems to be closely linked with the works of Tinctoris, presents a close interpretation of the Aristotelian text (almost a paraphrase) followed by a set of short *quaestiones*, the answers to which are based on the commentary by the main *auctoritas* followed by the master (in this case, Thomas Aquinas). Thus, this literary genre does not belong to the form of the pure literal commentary. Yet, given the fact that the commentary as a whole is mostly in the form of an *expositio* either of Aristotle's own text or of Aquinas' commentary to it, I have preferred to list it under the literal commentaries.

[972] The *De sensu* commentary is preceded in the manuscript by a *De anima* commentary which has the following *colophon* (immediately preceding the incipit of the *De sensu* commentary on f. 55v): "Expliciunt copulata venerabilis magistri Johannis Tinctoris super librum *De anima* extracta ex commento venerabilis sancti Thome quondam [...] per manus Theodorici de Alemania scripta".

MSS:

- Berlin, Staatsbibliothek-Preussische Kulturbesitz, Magdeburg 220 (previously, Magdeburg, Bibliothek der Domgymnasium, 220) (1472 and 1476), ff. 250r-260r[973].
- † München, Bayersciche Staatsbibliothek, Clm. 3600 (1444), ff. 55v-65v.
- Würzburg, Universitätsbibliothek, M.ch.f.118 (15th century), ff. 168r-173r.

10. Ioannes Versoris (d. after 1482) (?)

Expositio super libros Parvorum Naturalium **(including *De sensu*)**

Incipit[974]: "Circa inicium *Parvorum naturalium*. Iste primus liber vocatur *De sensu et sensato*, secundus *De memoria et reminiscencia*, tercius liber vocatur *De sompno et vigilia*. – Utrum de passionibus et operacionibus animatorum sit ponenda una sciencia distincta a sciencia de anima et de animalibus et a sciencia de plantis".

Explicit: "eciam sunt communiter in motu."

MSS:

- Saint-Quentin, Bibliothèque Municipale, 123 (108) (1456), item 6.
- Wien, Österreichische Nationalbibliothek, lat. 4777 (ca. 1472), ff. 89r-107r (anonymous).

[973] The text of Tinctoris' *De sensu* commentary, in this manuscript, "has been glossed by the scribe by means of notes referring to Petrus de Rivo's commentary on *De sensu et sensato*" (B. BARTOCCI, S. MASOLINI, "Reading Aristotle at the University of Louvain in the Fifteenth Century: A First Survey of Petrus de Rivo's Commentaries on Aristotle (II)", *Bulletin de Philosophie Médiévale* 56, 2014, pp. 281-383, p. 344). Indeed, in the ms. the text of Tinctoris' *Copulata super De sensu* is preceded by Petrus de Rivo's *Lectura* on the *De anima* (ff. 431v-504v), which, on the contrary, contains "references to and/or excerpta from works of Aegidius Romanus and Johannes Tinctoris" (*ibidem*).

[974] The *incipit* and *explicit* provided are those of the ms. Wien, Österreichische Nationalbibliothek, lat. 4777.

11. Malcomus Ramsay (late 15th century)[975]

Commentarium in De sensu

Incipit[976]: "Postquam Philosophus in libro precedenti determinavit de anima et potenciis eius secundum se, hic consequenter in libris *Parvorum naturalium* determinat de passionibus seu operationibus diversis ipsius anime. Pro quo notandum est quod sicut sunt quatuor (*sic!*) genera".

Explicit: "eodem sensu neque in diversis, quia si essent in diversis sensibus, cum illi sensu radicantur in una anima, iudicia contraria essent in eodem, quod est inconveniens."

Colophon: "Et sic est finis in sabbato ante adventum Domini immediate".

MSS:

- London, British Library, Sloane 748 (1485-1486), ff. 65-69v.

12. Marsilius de Inghen (ca. 1340-1396) (?)

Expositio libri De sensu et sensato

Incipit[977]: "– Circa inicium. *Par<vorum naturalium*>.– Item conclusio, que elicitur ex textu, est illa, quod ponenda est consideracio scientifica de proprietatibus et passionibus animatorum".

Explicit: "visibile et minor patet in textu. Et sic est finis."

Colophon: "Explicit liber *De sensu et sensato* et dicta per me Henricum Wecter (?) in Gottingen. Deo gracias. Amen".

MSS:

- † Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° F.334 (1421), ff. 168ra-179va.

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[975] Cf. ROBINSON, *Catalogue of Medieval Manuscripts of Latin Commentaries on Aristotle in British Libraries. Vol. III: Aberdeen and York*, *op. cit.*, p. 186: "'D. Malcomus Ramzay de Scocia' recorded at Cologne University, 1484 [*Die matrikel der Universität Köln, 1389 bis 1559*, ed. Hermann Keussen (1919), Bd. II: 141, no. 67); name, handwriting, and spelling of the vernacular confirm his Scottish origin. Ramsay's sketch at 79v, end of *Somn*., lib. ii, of a girl tickling a sleeping man with a feather and a dog with a bell on its collar alludes to the text. A tonsured figure kneeling before a bishop (69v) may be intended for Ramsay himself, and the full-page drawing of St Hubert kneeling before a stag (109v) indicate devotion to a saint revered in Cologne."

[976] The *incipit*, *explicit* and *colophon* of this commentary (together with the title) are given according to ROBINSON, *Catalogue of Medieval Manuscripts of Latin Commentaries on Aristotle in British Libraries. Vol. III: Aberdeen and York*, *op. cit.*, p. 186, since this commentary is not listed in Lohr's repertory.

[977] The *incipit* and the *explicit* given (as well as the *colophon*) are, evidently, those of the only known manuscript witness of the commentary.

13. Petrus de Rivo (van den Beken) (ca. 1420-1499)

Lectura super librum De sensu et sensato

Prooemium[978]: "Postquam in libro *De anima* determinatum sit de principio corporis animalis, videlicet de anima, consequenter in libris *Parvorum naturalium* determinatur de passionibus et operationibus ipsius. Et causa ordinis est quia in scientia naturali procedendum est a principiis ad principiata, ut dicitur prologo *Physicorum*. Est ergo hic talis ordo qualis observatur in libris *Physicorum*, ubi prius determinatur de principiis corporis mobilis quam de passionibus ipsius".

Incipit: "*Quoniam autem de anima*. Praesens liber dividitur in prohemium et tractatum. In parte prohemiali ostendit quod ad physicum spectat determinare de dictis passionibus corporum animatorum, quarum causae sunt potentia vegetativa, sensitiva et motiva".

Explicit: "Ad ultimam dicitur quod visio albi et visio nigri non contrariantur sicut nec species intentionales ipsarum."

Colophon (ms. Aberdeen): "Et sic finitur liber *De sensu et sensato* per Georgium de Morauia".

Colophon (ms. Berlin): "Et in hoc finitur liber *De sensu et sensato*. Deo gracias".

Colophon (ms. Greifswald): "Et in hoc finitur liber *De sensu et sensato* Aristotelis ipso die octavarum beati Vincencii martyris in conventu Hallensi, anno Domini m°cccc°lxxx°".

Editio critica (provisional): PETRUS DE RIVO, *Lectura super librum De sensu et sensato*, ed. S. MASOLINI, 2016, available online at the following link: https://dokumen.tips/documents/petrus-de-rivo-lectura-super-librum-de-sensu-et-sensato-magn-de-sensu-liber.html?page=1, last consulted on January 31st, 2023.

MSS:

- Aberdeen, University Library, 110 (15th century), ff. 49r-56v (the proem to the commentary is missing from this manuscript witness)[979].
- Berlin, Deutsche Staatsbibliothek-Preussische Kulturbesitz, Magdeburg 201 (15th century), ff. 250va-258rb.
- Greifswald, Bibliothek des Geistlichen Ministeriums, 34.D.IX (15th century), ff. 289ra-293va.

[978] The proem, *incipit* and *explicit* are given according to the preliminary version of Serena Masolini's critical edition of the commentary (established without considering the Aberdeen manuscript), available online at the following link: https://dokumen.tips/documents/petrus-de-rivo-lectura-super-librum-de-sensu-et-sensato-magn-de-sensu-liber.html?page=1, last consulted on January 31st, 2023).

[979] The discovery that the *Expositio* on the *De sensu* preserved in this manuscript is another witness of Petrus de Rivo's *Expositio* has been recently made by Serena Masolini (cf. S. MASOLINI, "Two Commentaries on the *De sensu et sensato* from Fifteenth-Century Louvain", *Micrologus* XXXI/bis, forthcoming). The commentary had previously been considered anonymous, probably due the absence of the proem to the work that introduces the commentary in the two other manuscript witnesses.

14. Petrus de Castrovol (Castrobel) (15th century)

***Super libros Parvos naturales* (including *De sensu*)**

MSS:

- Editio princeps: Lérida 1489 (*Super totam philosophiam naturalem Aristotelis*).

15. Rogerus Bacon (1214/1220-1292)

Liber de sensu et sensato

Incipit: "Licet vero in universali et in suo toto determinatum sit in libro *De animalibus* de omnibus partibus animalis quantum ad compositionem earum, et in libro *De anima* determinatum sit de organis sentiendi et objectis quantum ad eorum inmutationem, non superfluit in hoc libro *De sensu et sensato* determinare de eis quantum ad suam originem ex .iiij. elementis in particulari et in se".

Explicit: "De tussi vero, intelligendum est quod generatur in apertione gule et oris et exspiratione, et propter hoc non figitur aer neque tenetur in tantum ut formentur littere vel sillabe in eo ad vocalem arteriam, set est sonus non figuratus neque formatus in litteris."

Editio critica: ROGERUS BACON, *Liber de sensu et sensato. Summa de sophismatibus et distinctionibus (Opera hactenus inedita Rogeri Baconi Fasc. XIV)*, ed. R. STEELE, Oxford, Clarendon Press, 1937.

MSS:

- London, British Museum, Add. 8786, ff. 62r-84r (anonymous)[980].

16. Thomas de Aquino (ca. 1225-1274)

Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia

Incipit: "*Et de sensu et sentire* etc. Premisso prohemio in quo Philosophus ostendit suam intentionem, hic incipit prosequi suum propositum. Et primum determinat de ea que pertinent ad sensum exteriorem; secundo determinat de quibusdam pertinentibus ad cognitionem sensitiuam interiorem".

[980] For information concerning the manuscript, and for a discussion of the attribution of the work to Bacon, see EASTON, *Roger Bacon and His Search for a Universal Science: A Reconsideration of the Life and Work of Roger Bacon in the Light of His Own Stated Purpose*, *op. cit.*, pp. 232-235.

Explicit: "Inter reliqua uero *primo considerandum* occurrit *de memoria et reminiscencia et* de *sompno*, quia sicut per sensum cognoscuntur presencia, ita per memoriam cognoscuntur preterita et in sompno fit aliqua precognitio futurorum."

Editio critica: THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia (Sancti Thomae de Aquino Opera Omnia, Editio Leonina, Tomus XLV.2)*, ed. R.-A. GAUTHIER, Roma-Paris, Commissio Leonina-Vrin, 1986.

MSS[981]:

- Brugge, Stadtbibliothek 513 (13th-14th century), ff. 86r-100v.
- Bologna, Biblioteca Universitaria 1655[a] (13th-14th century), ff. 192r-216r.
- Cambridge, Peterhouse Library, 143 (I.4.7) (13th-14th century), ff. 42r-63v.
- Cambridge, Gonville and Caius College, 452 (379) (15th century), ff. 267r-270r (including only I 14-18).
- Città del Vaticano, Biblioteca Apostolica Vaticana, Barb. Lat. 309 (14th century), ff. 2r-20v.
- Città del Vaticano, Biblioteca Apostolica Vaticana, Borgh. 114 (beginning of the 14th century), ff. 194v-210v.
- Città del Vaticano, Biblioteca Apostolica Vaticana, Borgh. 152 (14th century), ff. 1r-22r.
- Città del Vaticano, Biblioteca Apostolica Vaticana, Urb. Lat. 217 (15th century), ff. 244v-273r.
- Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 825 (14th century), ff. 67r-91v.
- Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 846 (13th-14th century), ff. 12r-32r.
- Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 6758 (14th century), ff. 44r-68r.
- El Escorial, Biblioteca del Monasterio de san Lorenzo, f.II.8 (15th century), ff. 150r-190r.
- El Escorial, Biblioteca del Monasterio de San Lorenzo, h.II.1 (14th century), ff. 202v-206r and 217r-220v (including only Pr. 1-65 and I 13, 101 to the end).
- Firenze, Bibiloteca Medicea Laurenziana, Edili 158 (13th-14th century), ff. 39v-58v.
- Firenze, Biblioteca Medicea Laurenziana, Fiesolano 105 (15th century), ff. 173v-200v.
- Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. B.V.256 (13th-14th century), ff. 184v-200v.
- Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. J.V.42 (14th century), ff. 111v-136v.

[981] Note that the foliation of the manuscripts refers only to the *Sentencia libri "De sensu et sensato"*, and that, therefore, I do not list manuscripts containing only the *Sentencia libri "De memoria et reminiscencia"* or parts thereof.

- Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. J.VII.47 (14th century), ff. 11r-28r.
- Firenze, Biblioteca Riccardiana, 117 (1489), ff. 1r-30v.
- Grottaferrata, Bibliothèque du Collège des éditeurs de Saint Thomas, 10, second part (15th century, ca. 1467), ff. 94r-142v.
- Leipzig, Universitätsbibliothek, 1405 (14th century), ff. 66r-84v.
- Leipzig, Universitätsbibliothek, 1406 (14th century), ff. 48v-71r.
- Leipzig, Universitätsbibliothek, 1418 (14th century), ff. 84r-108r.
- London, Lambeth Palace Library, 97 (end of the 13th century), ff. 214r-234.
- Madrid, Biblioteca de la Universidad, 124 (117-Z-38) (13th-14th century), ff. 153v-179v.
- Oxford, Balliol College, 247 (13th-14th century), ff. 3r-50v.
- Oxford, Balliol College, 278 (beginning of the 14th century), ff. 42r-61v.
- Oxford, Balliol College, 311 (14th century), ff. 126v-148r.
- Oxford, Corpus Christi College, 490 (14th century), ff. 9r-10v (merely a fragment, going from I 7,56 to I 8,53).
- Oxford, Merton College, H.3.6 (275) (13th-14th century), ff. 44r-66r.
- Oxford, Merton College, O.1.5 (274) (beginning of the 14th century), ff. 284r-317v.
- Paris, Bibliothèque Nationale de France, Lat. 12968 (13th-14th century), ff. 124r-145r.
- Paris, Bibliothèque Nationale de France, Lat. 14714 (13th-14th century), ff. 163r-188v.
- Paris, Bibliothèque Nationale de France, Lat. 14722 (13th-14th century), ff. 212r-231v.
- Paris, Bibliothèque Nationale de France, Lat. 16102 (13th-14th century), ff. 129v-146v.
- Paris, Bibilothèque Nationale de France, Lat. 17818 (15th century), ff. 123r-190r.
- Paris, Bibliothèque Mazarine, 3485 (beginning of the 14th century), ff. 182v-204r.
- Pisa, Biblioteca del Seminario Arcivescovile di Santa Caterina, 18 (13th-14th century), ff. 10r-33v.
- Salamanca, Biblioteca Universitaria, 1747 (13th-14th century), ff. 153r-176r.
- Tarragona, Biblioteca Provincial, 120 (13th-14th century), ff. 53r-72r.
- Troyes, Bibliothèque de la ville, 884 (13th-14th century), ff. 49r-67r.
- Venezia, Biblioteca Nazionale Marciana, 1826 (Z.L.253) (14th-15th century), ff. 30r-53v.
- Wien, Bibliothek des Dominikanerklosters, 151/121 (14th century), ff. 95v-116v.
- Wien, Nationalbibliothek, 912 (beginning of the 14th century), ff. 1r-19r.

17. Thomas Bricot (d. 1516)/Georgius Bruxellensis (d. 1510)

***Textus abbreviatus philosophiae naturalis* (including *De sensu*)**

Incipit (*De sensu*): "Liber *De sensu et sensato* qui dividitur in proemium et tractatum. In proemio determinat Philosophus de operationibus anime sive virtutibus prout se tenent ex parte corporis".

Explicit: "*De somno et vigilia*."

MSS:

- Editio princeps (una cum continuatione textus magistri Georgii Bruxellensis): Lyon 1486.

18. Wicboldus Stutte (Sculte) de Osenbrughe (second half of the 14th century)

***Expositio circa libros Philosophi Parvorum naturalium* (including *De sensu*)**

Prologus[982]: "Ad Summi Conditoris laudem cui laudum praeconia per aeternum et quorundam mihi alectorum propter rogatus".

Incipit: "*Quoniam autem de anima* – Liber iste dividitur in partem prooemialem et executivam".

MSS:

- Mainz, Stadtsbibliothek, I.613 (15th century), ff. 108r-163r[983].

B. Question Commentaries

19. Alexander de Trebovia (15th century) (?)

Quaestiones in librum De sensu et sensato Aristotelis secundum Quaestiones Ioannis Buridani

Incipit[984]: "Queritur circa librum *De sensu et sensato*: Utrum praeter determinationem libri <*De anima*> et librorum *De animalibus et plantis* oportet etiam determinationem de operationibus et passionibus animatorum <habere>".

[982] The prologue and the *incipit* of the commentary are given, evidently, according to those of its only known manuscript witness. It has been impossible to ascertain the *explicit* in the absence of a direct consultation of the manuscript.
[983] The foliation refers to the whole *Parva naturalia*. The text is fragmentary at the end, but complete for what concerns the *De sensu*.
[984] The *incipit* and the *explicit*, together with the second quaestio of the commentary, are given according to those of its only known manuscript witness.

Q. 2: “Utrum omni animali sint necessaria gustus et tactus”.

Explicit: “pars enim que patitur magis ab agente prius corrumpitur.”

MSS:

- Praha, Biblioteka Národní Knihovna, Truhlář 561 (III.H.8), 5° (1449), ff. 107v-112r (anonymous).

20. Galfridus de Aspall (d. 1287)

***Quaestiones super librum De sensu et sensato*[985]**

Incipit[986]: “*Quoniam autem de anima* etc. In hoc libro qui intitulatur *De sensu et sensato* intendit Aristoteles determinare de natura ipsorum instrumentorum sensitivorum, et etiam de natura suorum obiectorum. Et quia sentire est operatio quaedam animae sive ab anima, sit prima quaestio an anima sit aliquid; secunda an de anima, adminus sensitiva, possit esse scientia”.

Explicit: as given in the list of the single manuscript witnesses (the text is incomplete at the end in all manuscripts, but at different points).

MSS:

- Cambridge, Gonville and Caius College, 386 (509) (late 13th century), ff. 287r-302r (anonymous).
  Expl.: “sicut quando unus color diversificatur propter diversam incidentiam.”
- Oxford, Merton College, 272 (O.1.4) (late 13th century), ff. 254r-273r (incomplete at end).
  Expl.: “cum angulus quilibet sic dividitur per Euclidem, quia per ipsum in duo media aequalia, species igitur rei visae est in oculo quilibet angulus est divisibilis”.
- Oxford, New College, 285 (13th century), ff. 164-189 (anonymous).
  Expl.: “ergo a simili ita erit de odoribus. Explicit.”
- Todi, Biblioteca Comunale, 23 (13th century), ff. 99v-123r.
  Expl.: “Quia ita est in coloribus et saporibus quod extremi commiscentur ad invicem ad generationem mediorum, ita quod est reperire tam in coloribus quam in saporibus quinque medios notabiles et duos extremos; ergo a simili ita est de coloribus.”

[985] On Aspall’s *Quaestiones*, cf. THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, ed. GAUTHIER, *op. cit.*, pp. 124*-125*. Gauthier dates the composition of the work around 1260.

[986] The *incipit* is given according to EBBESEN, THOMSEN THÖRNQVIST, DECAIX, “Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue”, *op. cit.*, p. 66. The authors, however, are not aware of the text of Aspall’s commentary preserved in ms. Oxford, New College, 285, ff. 164-189.

21. Gualterus Burlaeus (ca. 1275-1344)

a. Quaestiones super librum De sensu et sensato (recensio I) (?)[987]

Incipit[988]: "*Quoniam autem determinatum est de anima* – Quaeritur, utrum de sensu et sensato sit scientia? Videtur, quod de sensato non sit scientia. Nam de eo, quod non apprehenditur ab intellectu, non est scientia".

Q. 2: "Utrum numerus et distinctio sensuum exteriorum accipiuntur secundum obiecta?"

Q. 16 (last one): "Utrum sensus passivus possit sentire sensibilia contraria, ut visus album et nigrum?"

Explicit: "et ideo immutatio unius non impedit immutationem alterius. Expliciunt quaestiones *De sensu et sensato* secundum Burle."

MSS:

- † London, British Museum, Add. 18630 (first half of the 15th century), ff. 54r-67v.
- † Oxford, Merton College Library, 276 (H.2.8) (early 14th century), ff. 1r-8v (anonymous)[989].

b. Quaestiones super librum De sensu et sensato (recensio II)

Incipit: "Sicut dicit Themistius super librum *De anima*".

Q. 1 (f. 49rb): "Queritur ergo primo circa hunc librum utrum de sensu et sensato possit esse scientia".

Explicit: "ideo in illam operationem bene potest sensus et si non intellectus (?). Amen."

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[987] The order of the two *recensiones* is only tentative, and mostly based on the fact that *recensio* I presents a shorter and less developed text, while *recensio* II seems to represent a more mature question commentary (see Chapters 3 and 4 respectively for the case of the discussion of *minima sensibilia* in the two *recensiones*). As already stressed in Chapter 3, however, Burley's authorship of this *recensio* of the *Quaestiones* is merely based on the attribution in the London manuscript, and, given that such attribution has passed unnoticed until now, it is only suggested as a hypothesis in this context, awaiting a full palaeographic and codicological study of the text of the commentary in the London manuscript.

[988] The *incipit*, *explicit*, and the second and last *quaestiones* are given according to those found in the ms. Oxford, Merton College Library, 276.

[989] Q. 15 of the commentary (*Utrum sensu particularis possit sentire sensibilia contraria simul, ut visus album et nigrum*) has been edited, anonymous and only on the basis of ms. Merton 276, in TOIVANEN, " Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 174-175. Q. 4 of the commentary (*Utrum aliquis sermo sit naturalis homini*) has been edited, anonymous and only on the basis of ms. Merton 276, in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 155-157. Unfortunately, as said, neither Toivanen nor Ebbesen are aware of the ms. London, BM, Add. 18630, and they do not know that the two manuscripts report the same text, attributed to Burley in the *colophon* of the London manuscript.

MSS:

- † Città del Vaticano, Biblioteca Apostolica Vaticana, Ottob. Lat. 2165 (14th century), ff. 48v-63v[990].

22. Iacobus Tymens de Amersford (d. 1493) (?)

In Aristotelis De sensu et sensato

Incipit[991]: "*Quoniam autem de anima secundum seipsam* etc. Isti sunt libri *Parvorum naturalium* editi ab Aristotile in complementum philosophie naturalis et eorum que dicta sunt in libris (*sic!*) *De anima*. Inter quos primus inscribitur liber *De sensu et sensato*. Qui prima sui divisione dividitur in partem prohemialem et executivam".

Q. 1: "Circa dicta movetur questio utrum ad philosophie naturalis complementum requirantur cum libris principalibus eciam libri *Parvorum naturalium*".

Explicit: "Secus autem est de sono si loquamur de eo secundum esse materiale in medio. Nam sic per medii divisionem potest realiter dividi et per consequens materialiter multiplicari, sicut patet de sono echou. Et patet etc."

Colophon: "Et tantum *De sensu et sensato* scripto per manus Johannis Groningensis. Sequitur *De memoria et reminiscentia*. De quo laus Deo in evum".

MSS:

- Groningen, Universiteitsbibliotheek, 101 (1487-1489), ff. 132r-160v (anonymous).

23. Ioannes Buridanus (ca. 1300-ca. 1361)

a. *Quaestiones super librum De sensu et sensato (Recensio I)*[992]

Incipit: "Potentiae sensitivae ipsius animae et potentiae vegetativae et potentiae secundum locum motivae non exercent operationes suas sine organo".

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[990] For a detailed analysis of the structure and contents of this manuscript, as well as a comparison with the text of the *Expositio*, see TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 124-131. Toivanen (*ibid*., pp. 194-198) has also edited the last *quaestio* of the commentary preserved in this manuscript (q. 26, *Utrum contingat aliquem sentire simul diversa sensibilia*).

[991] The *incipit*, *explicit*, *colophon* and first *quaestio* are given according to the only known manuscript witness of the commentary.

[992] Q. 21 of the commentary (*Utrum aliquis potest sentire plura simul distincte et perfecte*) has been edited (using the Erfurt manuscript, the two München manuscript, therefore also the one I list under *recensio II* of the commentary, the Sankt Gallen manuscript and the Vatican manuscript) in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 217-225. Q. 3 of the commentary (*Utrum caeci a nativitate habentes auditum debeant esse sapientiores quam surdi a nativitate habentes visum*) has been edited (using only the Erfurt manuscript and the Lokert 1516 printed edition) in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 184-189.

Q. 1: “Utrum praeter determinationem libri *De anima* et librorum *De animalibus et plantis* oportet esse aliam determinationem de operationibus et passionibus animatorum”.

Explicit: “et ita etiam attendens multum ad gradum intentionis albedinis non bene simul attendat quanta sit superficies. Et haec dicta sufficiant de sensu et sensato.”

Editio critica: IOANNES BURIDANUS, *Jana Burydana. Quaestiones super Parva Naturalia Aristotelis. Edycja krytyczna i analiza historyczno-filozoficzna*, ed. M. STANEK, Ph.D. thesis, Katowice, Uniwersytet Śląski w Katowicach, 2015[993].

MSS:

- † Amiens, Bibliothèque de la Ville, 402 (15th century), ff. 271r-284v (anonymous).
- Basel, Universitätsbibliothek, F.V.10 (ca. 1343), ff. 161r-169v[994]. Colophon: "Expliciunt *Quaestiones* Buridani super *De sensu et sensato* Aristotelis”.
- Basel, Universitätsbibliothek, F.VIII.17 (1422), ff. 133r-164r (anonymous).
- Berlin, Deutsche Staatsbibliothek-PK, Lat. Fol. 566 (1382), ff. 66r-88r (incomplete and anonymous).
- Bernkastel-Kues, St. Nikolaus Stift, 187 (Marx) (15th century), ff. 1r-32v (anonymous).
- † Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 11575 (14th-15th century), ff. 92r-109r[995].
- Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° F. 357 (end of the 14th century), ff. 131ra-148va[996].
- Firenze, Biblioteca Medicea Laurenziana, Ashb. 1348, ff. 19v-38v (anonymous).
- Klagenfurt, Bischöfliche Bibliothek, XXXI.b.5 (14th-15th century), ff. 125ra-143vb[997].

[993] Unfortunately, I have not been able to access the text. Note that a critical edition based on the results of his Ph.D. thesis is currently being prepared by Stanek for publication. The *incipit*, explicit, and first *quaestio* are given according to the updated version of Lohr's repertory.

[994] This is the earliest extant witness of *recensio I* of Buridan’s *Quaestiones* on *De sensu*.

[995] Colophon: "Expliciunt questiones super librum *De sensu et sensato* secundum Biridanum. Deo gracias. Amen etc.”

[996] Colophon (to the questions to the whole *Parva naturalia*, f. 170v): “Expliciunt questiones *Parvorum naturalium* magistri Iohannis Biridani”.

[997] Note that the text of the commentary in this manuscript is frequently supplemented by *Problemata* (starting from f. 127r). An edition of these *Problemata*, which probably date to the beginning of the 15th century and which are also found in another manuscript witness of *recensio I* of Buridan’s commentary, namely ms. München, Bayersiche Staatsbibliothek, Clm. 18248, and, as a separate work, in ms. Kraków, Biblioteka Jagiellońska, 2179, has been published in M. STANEK, “*Problemata Parvorum naturalium*: An Anonymous Supplement to John Buridan’s Commentary on the *Parva naturalia*”, *Przegląd Tomistyczny* XXVII, 2021, pp. 61-105, pp. 85-91. The *Problemata* are associated with all the questions of Buridan’s commentary, apart from q. 1 (*Utrum praeter determinationem libri* De anima *et librorum* De animalibus et plantis *oportet esse aliam determinationem de operationibus et passionibus animatorum*), q. 2 (*Utrum omni animali necessarii sint tactus et gustus*), q. 9 (*Utrum nigredo sit pura privatio albedinis’), q. 11 (‘Utrum lux vel lumen sit de essentia coloris*). Note as well that at f. 125ra there is a *tabula quaestionum* of the commentary (Incipit: “<T>abula questionum *Parvorum naturalium*”), followed by the *incipit* “Questiones Biridani super *Sensu et sensato* Aristotelis, [...].”

- Kraków, Biblioteka Jagiellońska, 737 (14th century), ff. 46ra, 46rb—62ra (anonymous)[998].
- † Leipzig, Universitätsbibliothek, 1416 (1422), ff. 234v-248v (incomplete and anonymous).
- † Liège, Bibliothèque de l'Université, 346C (469) (14th-15th century; 1370?), ff. 190r-201r (anonymous)[999].
- † München, Bayerische Staatsbibliothek, Clm. 18248 (beginning of the 15th century), ff. 220ra-239va[1000].
- Praha, Knihovna Metopolitní Kapituli, Podlaha 1272 (L. XXIX) (1376), ff. 85r-101v[1001].
- Sankt Gallen, Stiftsbibliothek, 775 (1374), ff. 121r-177r[1002].
- Wien, Österreichische Nationalbibliothek, 5454 (ca. 1397), ff. 60r-73r (anonymous).

b. Quaestiones super librum De sensu et sensato (Recensio II)

Given the important differences between the *incipit* and the *explicit* of each manuscript witness of this recensio of Buridan's commentary, I provide them separately for each manuscript witness, together with the prologue and the *colophon* whenever available.

- Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° F.298 (after 1352), ff. 134r-144ra (anonymous). Quaestiones super librum "De sensu et sensato" Aristotelis.

[998] On this manuscript witness, see M. ZWIERCAN, "*Quaestiones brevissimae super librum De sensu et sensato* et *Quaestiones super Parva naturalia* de Jean Buridan dans les manuscrits de la Bibliothèque Jagellonne (Supplément au catalogue des oeuvres de Jean Buridan)", *Mediaevalia Philosophica Polonorum* 12, 1966, pp. 31-32.

[999] The text seems to share a common origin with Buridan's *Quaestiones super librum De sensu et sensato* as reported in ms. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, F.357 (cf. A. PATTIN, *Repertorium Commentariorum Medii Aevi in Aristotelem Latinorum quae in Bibliothecis Belgicis asservantur*, Leuven-Leiden, Leuven University Press-Brill, 1978, p. 104).

[1000] Note that the text of the commentary in this manuscript is frequently supplemented by *Problemata* (starting from f. 222r). An edition of these *Problemata*, which probably date to the beginning of the 15th century and which are also found in another manuscript witness of *recensio I* of Buridan's commentary, namely ms. Klagenfurt, Bischöfliche Bibliothek, XXXI.b.5,, and, as a separate work, in ms. Kraków, Biblioteka Jagiellońska, 2179, as said, has been published in STANEK, "*Problemata Parvorum naturalium*: An Anonymous Supplement to John Buridan's Commentary on the *Parva naturalia*", *op. cit.*, pp. 85-91. Note as well that at f. 220ra it has been written by another hand of the 15th century: "Quaestiones *Parvorum naturalium* Byridani". Moreover, q. 1 of the commentary (at f. 220rb) is introduced as follows: "Queritur primo a Byridano utrum [...]."

[1001] On this manuscript witness, see R. PALACZ, "Les traités de Jean Buridan conservés dans les mss. de la Bibliothèque du Chapitre à Prague", *Mediaevalia Philosophica Polonorum* 14, 1970, p. 54. The *colophon* to the commentary is the following one: "Finis questionum libri *De sensu et sensato* Biridani". The *colophon* to the whole Buridanian *Quaestiones* on the *Parva naturalia* (at f. 124v) is the following one: "Finis questionum *Parvorum naturalium* reverendi magistri Johannis Biridani finite cum diligencia et sub anno Domini 1376. Deo gracias."

[1002] Colophon (to the whole *Quaestiones Parvorum librorum naturalium*, at f. 253): "Expliciunt questiones *Parvorum librorum naturalium* a magistro glorioso, magistro Johanne Buredaen compilate nec non finite anno Domini M CCC septuagesimo quarto in festo sancti Augustini doctoris."

Prologus: “Post libros philosophie naturalis, scilicet *De celo* et *Metheororum* et *De generacione* sequitur tractare in naturali sciencia de animatis. Et illa pars, que est de animatis, habet tres partes principales”.
Q. 1: “Queritur primo circa librum *De sensu et sensato*, utrum de operacionibus et passionibus animalium debet esse sciencia naturalis distincta a sciencia libri *De anima* et librorum *De animalibus et plantis*, et arguitur primo per quasdam conclusiones racionales, quod de eis non sit sciencia”.
Explicit: “et hoc magis hoc indigemus propter magnitudinem cer<e>bri , sicut dictum fuit. Expliciunt questiones super librum *De sensu et sensato*.”

- † Milano, Biblioteca Ambrosiana, G.71.Sup. (14th-15th century; for the *De sensu* commentary, 1359), ff. 64r-78r.
Incipit: “Queritur primo utrum de operationibus sive de passionibus communibus anime et corporis debeat esse scientia distincta istius libri a scientia libri *De animalibus et plantis* et ab aliis scientiis [...] in aliis *Parvis libris*”.
Explicit: “Ideo oportet quod utatur organo corporeo ad istas [...] operationes et ad consimiles. Et sic finiantur questiones super librum *De sensu et sensato* etc. Amen.”
Colophon: “Expliciunt questiones libri *De sensu et sensato* secundum magistrum Johannem Buridanum parixinum doctorem scipte et finite per me Bartholomeum de Castro Arquato de Placentia <anno Domini> m° ccc° lviiii° [1359] die septembris. Amen Amen et cetera”.
- München, Bayerische Staatsbibliothek, Clm. 19551 (1383 for the ff. 2r-31r and 1378 for the ff. 36r-145r), ff. 126r-129r[1003] (anonymous).
Incipit: “Post libros philosophie naturalis, scilicet *De celo* et *Metheororum*, et *De generacione* sequitur tractare in naturali sciencia de animatis et illa pars que est de animatis habet tres partes principales. Prima est de anima et de eius potenciis et operacionibus et illa fuit tradita in libro *De anima*. Secunda pars est de potenciis et passionibus sive operacionibus communibus corporis et anime, secundum quod tenet ex parte corporum et ista traditur in libris *Parvis naturalibus*. Tercia pars est de corporibus animatis in speciali et traditur in libro *De animalibus*”.
Q. 1: “Queritur primo circa librum *De sensu et sensato*, utrum de operacionibus et passionibus animalium debeat esse sciencia naturalis distincta a sciencia libri *De anima* et librorum *De animalibus et plantis*, et arguitur primo per quasdam communes raciones, quod de eis non debeat esse determinacio specifica”.
Explicit: “ad gradum intensionis albedinis non simul bene attendat, quanta sit superficies et sic patet questio. Expliciunt huiusmodi questiones *De sensu et sensato* inquantum.[1004]”

[1003] Michael, who did not examine the manuscript, suggested that the text contained is the *recensio I*, i.e., that of the Lokert edition (cf. MICHAEL, *Johannes Buridan: Studien zu seinem Leben, seinen Werken und zur Rezeption seiner Theorien im Europa des späten Mittelalters*, *op. cit.*, Vol. II, p. 742). Yet, the first *quaestio* clearly resembles the second *recensio* of the commentary. Only a direct examination of the manuscript could clarify the issue. Here I have chosen to list this witness as containing the second *recensio*, so as to signal the fact that the text it contains could, at least partially, differ from that of the first *recensio*.
[1004] Note that at the ff. 69rb-69va there is a *tabula quaestionum* of the work.

24. Ioannes de Caulaincourt (*fl.* ca. 1478-1483)

***Quaestiones super librum De sensu et sensato*[1005]**

Incipit[1006]: "Circa initium libri *De sensu et sensato* Aristotelis quaeritur: Utrum corpus sensitivum sit addequatum libri *De sensu et sensato* subiectum? Arguitur primo quod non".

Q. 2 (f. 170r): "Utrum homines habeant peiorem odoratum ceteris animalibus".

Q. 3 (last one) (f. 172v): "Utrum qualitates sensibiles sint in infinitum divisibiles".

Explicit: "eiusdem proprcionis et inexistentes quarum quelibet est pars quantitativa et entitativa ipsarum qualitatum sensibilium. Et haec de libro *De sensu et sensato*."

Colophon: "Explicit liber *De sensu et sensato* scriptus per me Anthonium de Courtignon sub venerabili viro magistro Iohanne de Caulaincourt XXIIII quarta (*sic!*) mensis maii millesimo CCCC^{mo} octuagesimo primo [1481] (*sign.* A. de Courtignon)".

MSS:

- Mende, Bibliothèque Publique (BM), 40 (1480-1481), ff. 166v-174v.

25. Ioannes de Janduno (ca. 1285-1328)

***Quaestiones super librum De sensu et sensato*[1007]**

Incipit: "Utrum de communibus passionibus animae et corporis possit esse scientia. Videtur quod non".

Q. 1: "Utrum de communibus passionibus animae et corporis possit esse scientia".

Explicit: "per se potest movere visum. Eadem ratione de qualibet virtute movente. Finis."

[1005] The text is attributed to Ioannes de Magistris in the printed editions (*Quaestiones super tota philosophia naturali cum explanatione textus secundum mentem Doctoris subtilis Scotis* (including *De sensu*), but to Caulaincourt in the manuscript. On this commentary, see P.J.J.M. BAKKER, "Natural Philosophy and Metaphysics in Late Fifteenth-Century Paris. III. The Commentaries on Aristotle by Johannes de Caulaincourt (alias Johannes de Magistris)", *Bulletin de Philosophie Médiévale* 49, 2007, pp. 195-237, esp. p. 201 and pp. 229-230.

[1006] The *incipit*, *explicit*, second and third *quaestiones* and *colophon* are given according to those of the only known manuscript witness of the commentary.

[1007] Q. 33 (*Utrum unus sensus possit simul apprehendere sensibilia diversorum sensuum genere*), and q. 34 (*Utrum unus sensus percipiat contraria vel sensibilia diversorum generum sub unica actione*) of the commentary have been edited (based on all the manuscripts, save for Venezia, Biblioteca Nazionale Marciana, Lat. VI.82, whose existence Toivanen ignores) in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 199-208. Q. 7 of the commentary (*Utrum omnis surdus a nativitate sit mutus*) has been edited (using only the Oxford manuscript and a 1557 printed edition) in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 178-183.

MSS:

- † Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 6768 (14th century, quoting as date of the course 1309), ff. 100r-122v.
- † Oxford, Bodleian Library, Canon. Misc., lat. 222 (1421), ff. 1-38 (anonymous).
- † Sevilla, Biblioteca Capitular y Colombina, 7-7-19 (15th century), ff. 37r-72 (anonymous).
- † Venezia, Bibl. Marc., Lat. VI.82 (Valentinelli 3019) (15th century), ff. 1r-35r (anonymous).
- † Venezia, Bibl. Marc., Lat. Z.259 (Valentinelli 1756) (15th century), ff. 217v-266v (incomplete).

26. Ioannes de Slupcza (1408-1488) (?)

In De sensu et sensato

Incipit (*De sensu*): "Utrum de communibus operacionibus et passionibus corporis et anime possit esse sciencia specialis? Notandum: operaciones et passiones corporis et anime sunt sensus, sensacio, memoria, desiderium, gaudium, tristicia, ira et huiusmodi".

Explicit (*De somno et vigilia*): "quia calidum magis intensum magis habet elevare, sed in iuvenibus calidum est magis intensum, quia est magis siccius (*sic!*)."

MSS:

- Kraków, Biblioteka Jagiellońska, 2099 (1433), ff. 164-174r (anonymous).

27. Ioannes Felmingham (late 13th century) (?)

***Expositio*[1008] *in librum De sensu et sensato*[1009]**

Incipit[1010]: "*De anima secundum ipsum determinatum est* etc. [C]irca processum Philosophi in *De sensu et sensato* duo sunt intelligenda. Primo sub qua parte philosophiae naturalis iste liber continetur, secundo qualiter in isto procedit".

[1008] The commentary divides the Aristotelian text in nine chapters, and for each of them raises one or more *dubitationes*. This is the reason why the commentary is here treated as a question commentary, rather than as a literal one.

[1009] The section of this commentary concerning *De sensu* 7 (the ninth chapter of the commentary, dealing with the *dubitatio Utrum plura sensibilia possunt simul sentiri ab eodem sensu*) has been edited in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 189-193. The third dubitatio from the secund chapter of the commentary (*Utrum omnes surdi a nativitate sint muti*) has been edited in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 183-184.

[1010] The *incipit*, *explicit*, second and first *quaestio* are given according to those of the only known manuscript witness of the commentary.

Q. 1 (f. 159r): “Utrum de sensu et sensato possit esse scientia”.

Explicit: “temporis uel instantis quod sit in eodem loco primo. Ex praedictis patet natura aliqualiter sensuum exterirorum et interiorum, quae se habent ut ministri ad ipsum intellectum, per quem contingit cognoscere summum intelligibile, sc. Deum, ad quem nos perducat qui sine fine vivit et intellgit. Amen. Amen Amen.”

MSS:

- † Cambridge, Gonville and Caius College, 512 (543) (around the second and the third decade of the 14th century), ff. 158v-170v (incomplete at end, anonymous, but in the margins of f. 167: *felmingham*).

28. Ioannes Hennon (*fl.* ca. 1464-1484) (?)

Liber philosophiae Aristotelis (Commentarii in Aristotelis libros Physicorum, parva Naturalia et Metaphysicam) **(including *Questiones in librum Aristotelis De sensu et sensato*)**[1011]

Incipit[1012]: “*Quoniam autem de anima...*Circa initium libri *De sensu et sensato* talis movetur questio: Queritur, utrum corpus sensitivum inquantum sensitivum sit adequatum subiectum libri *De sensu et sensato*. Et arguitur quod non quia: parvorum naturalium est aliquod unum adequatum subiectum”.

F. 284vb: “Conclusio responsalis: corpus sensitivum inquantum sensitivum est adequatum subiectum huius libri.”

F. 284vb: “Dubitatur primo utrum visio fiat extramittendo vel intus suscipiendo.”

F. 285va: “Dubitatur secundo utrum in hoc libro sit determinandum de omnibus obiectis sensuum, ostendendo quid unumquodque horum sit.”

F. 286rb: “Dubitatur tercio utrum tantum sint septem species colorum.”

Q. 2 (and last one), f. 286vb: “Queritur utrum odor qui realiter in medio multiplicatur, ab hominibus deterius percipiatur”.

F. 290ra: “Conclusio responsalis: odor qui in merio realiter multiplicatur, deterius ab hominibus percipitur.”

F. 290ra: “Dubitatur primo utrum animalia nutriantur odoribus.”

[1011] On this commentary, see P.J.J.M. BAKKER, “Natural Philosophy and Metaphysics in Late Fifteenth-Century Paris. I. The Commentaries on Aristotle by Johannes Hennon”, *Bulletin de Philosophie Médiévale* 47, 2005, pp. 125-155, esp. p. 138 and pp. 152-153.

[1012] The *incipit*, *explicit*, *conclusiones*, *dubitationes* and *quaestiones* are given according to the only known manuscript witness of the commentary.

F. 291ra: “Dubitatur secundo utrum qualitates sensibiles sint divisibiles in infinitum.”

F. 291vb: “Dubitatur tercio utrum lumen multiplicitetur per medium sine motu locali.”

Explicit (f. 292v): “Rationes ante oppositum solvuntur ex dictis. Et sic de questione et per consequens de toto libro. Explicit liber *De sensu et sensato*. Sequuntur auctoritates libri *De memoria et reminiscencia*.”

F. 292v: “virtus extrema sine posteriori”.

MSS:

- † Paris, Bibliothèque nationale de France, Lat. 6529 (1473), ff. 282r-292v[1013].

29. Ioannes Le Damoisiau (Damoisiaulx) (*fl.* ca. 1488)

Commentum in De sensu et sensato[1014]

Incipit[1015]: “Iste est liber *De sensu et sensato* in quo Philosophus determinat de corpore sensitivo. Et dividitur in novem capitula. In primo capitulo ponit quedam praeambula valentia ad cognitionem sequentium. Et dividitur in tres particulas”.

Q. 1 (f. 245r): “Queritur utrum corpus sensitivum inquantum sensitivum sit subiectum adequatum scientie huius libri (*ms.* huius)”.

F. 247r: “Dubitatur primo que res sit color et in quo est subiective”.

F. 248r: “Dubitatur secundo quid sit sapor, et quid odor, et de subiectis et speciebus eorundem”.

F. 248v: “Dubitatur tertio utrum qualitates sensibiles sint in infinitum divisibiles, et utrum sit dare minimum saporem”.

F. 250r: “Conclusio responsalis: corpus sensitivum inquantum sensitivum est scientie huius libris adequatum subiectum.”

[1013] Colophon (to the whole commentaries by Hennon included in the manuscript, f. 327ra): “Completus est presens liber philosophiae Aristotelis in alma Parisius universitate conditus ab eximio viro doctissimo magistro Iohanne Henno<e> (?) in sacra pagina protunc baccalario formato. Et scriptus per me Franciscum Fine in preclara artium facultate eo tunc studentem in collegio parve Navarre in monte Sancte Genovefe virginis Anno domini <nostri Jesu Christi> M CCCC°LXXIII [1473] die vero prima octrobris de fine cuius laudes extollo Terno et Uni viventi in secula etc. Amen”.

[1014] On this commentary, see P.J.J.M. BAKKER, “Natural Philosophy and Metaphysics in Late Fifteenth-Century Paris. II. The Commentaries on Aristotle by Johannes Le Damoisiau”, *Bulletin de Philosophie Médiévale* 48, 2006, pp. 207-228, esp. pp. 211-212 and p. 225.

[1015] The *incipit*, *explicit*, *conclusiones*, *dubitationes* and *quaestiones* are given according to the only known manuscript witness of the commentary.

Explicit: “est eadem scientia quoad passiones totius, sed comparando quodlibet eorum ad suas proprias passiones ipsorum sunt distinctae scientiae. Ad quintam patet solutio ex dictis. Et hoc <est> de questione, et per consequens de toto libro *De sensu et sensato* dicta sufficiant. Finito xxv[a] die maii anno etc.”

MSS:

- † Wroclaw, Byblioteka Uniwersytecka, IV.F.8 (1480), ff. 241r-250v (anonymous).

30. Ioannes Versoris (d. after 1482)

Quaestiones supra librum De sensu et sensato

Incipit: “Circa initium *Parvorum naturalium* quaeritur primo utrum corpus sensitivum sit subiectum scientiae huius libri”, or “Circa initium libri (*sic!*) *Parvorum naturalium* quaeritur primo utrum corpus animatum sit subiectum in libro (*sic!*) *Parvorum naturalium* et corpus sensitivum sit subiectum in isto libro *De sensu et sensato*”.

Q. 2: “Utrum omnes sensu exteriores sint necessarii cuilibet animali”.

Explicit: “Ad rationes ante oppositum patet solutio ex dictis. Et sic est finis huius libri.”

MSS[1016]:

- Aarau, Aargauische Kantonsbibliothek, Wett.F.42 (15th century), item 3.
- Angers, Bibliothèque Municipale, 324 (315) (15th century), ff. 94r-104v.
- Basel, Universitätsbibliothek, F.III.10 (15th century), ff. 260r-273v.
- Basel, Universitätsbibliothek, F.VII.11 (1452/1455[1017]), ff. 336r-348r.
- Berlin, Deutsche Staatsbibliothek-PK, lat. Fol. 402 (15th century), ff. 244r-268v.
- Bonn, Universitätsbibliothek, 127 (1452), item 7. I
- † Città del Vaticano, Biblioteca Apostolica Vaticana, Palat. Lat. 1050, ff. 296r-319r (anonymous).
- Graz, Universitätsbibliothek, 853 (1467), ff. 238ra-274.
- Klagenfurt, Universitätsbibliothek, Studienbibl. Pap. 74 (15th century), item 6.

[1016] Cf. LOHR, *Latin Aristotle Commentaries I.1. Medieval Authors. A-L, op. cit.*, pp. 348-349: "Note: Several other MSS which include the corpus of Versor’s physical works occasionally show variant incipits reflecting posisbly different redaction or different authorship: Amiens BV 402 [see above; yet the attribution to Versor remains uncertain], Basel F.VII.11 (1455), ff. 336r-348r, *De sensu*, Inc.: “Circa librum *De sensu et sensato* quaeritur primo: Utrum corpus animatum sit subiectum in libris parvorum naturalium vel corpus sensitivum in hoc libro”, Mantova, Biblioteca Comunale F.IV.9 (15th century), ff. 241v-254v, *De sensu*, Oxford, Bodl., Digby 44 [see below; yet the attribution to Versor remains uncertain]. The commentary on the *Parva naturalia* is found in two forms and there are many authors (Folpardus de Ameronghen, Johannes Friss, Nicolaus Stoyczin) whose works are very close to those of Versor.”

[1017] The date of the lectures of the *Quaestiones super Parvis naturalibus* by John Versoris reported in the manuscript can be determined by the *colophon* to the whole work on f. 359v: “Finitum est hoc opus in alma matris universitatis studio inclytae urbis parisiensis anno dominicae incarnationis 1455 die 15 mensis ianuarii per me Johannem Heynlin de Lapide pro tunc studentem ibidiem”.

- Kraków, Biblioteka Jagiellońska, 2016 (1473), ff. 124r-150v (anonymous, doubtful attribution).
- Kraków, Biblioteka Jagiellońska, 2072 (1462-1465), ff. 140ra-163vb; 187va-189va (anonymous)[1018].
- Kraków, Biblioteka Jagiellońska, 2599 (third quarter of the 15th century), ff. 73ra-98rb (doubtful attribution, incomplete at end).
- † Leipzig, Universitätsbibliothek, 1419 (15th century), ff. 193r-210v.
- Luxembourg, Nationalbibliothek, 53 (80) (15th century), ff. 229r-251r.
- Madrid, Biblioteca Nacional, 9018 (15th Century), ff. 130v-137r.
- Madrid, Escorial, Biblioteca Real, M.II.1 (15th century), ff. 309r-320v.
- Modena, Biblioteca Estense, Fondo Camp. 88 (gamma D.1.21), ff. 78r-90v.
- München, Universitätsbibliothek, 568 (15th century), item 2.
- Nürnberg, SB, Cent.V.47 (15th century), ff. 390r-401v (anonymous).
- Oxford, Bodleian Library, Canon. misc. 211 (1446-1447, 1443), ff. 233-245v.
- Pamplona, Biblioteca de la Catedral, 24 (15th century), ff. 182r-192v.
- Poitiers, Bibliothèque Municipale, 138 (236) (1451), ff. 328r-345v (anonymous).
- Praha, Biblioteka Národní Knihovna, Truhlář 223 (I.E.38) (1459), ff. 334-350v.
- Praha, Biblioteka Národní Knihovna, Truhlář 750 (IV.G.18) (15th century, before 1479), ff. 296r-311v.
- Praha, Biblioteka Národní Knihovna, Truhlář 902 (V.E.8) (1453-1454), ff. 157r-171r.
- Praha, Biblioteka Národní Knihovna, Truhlář 903 (V.E.9) (15th century, in part 1457), ff. 249v-266r.
- Praha, Biblioteka Národní Knihovna, Truhlář 906 (V.E.12) (15th century, 1455 and 1444), ff. 73r-89v.
- Praha, Biblioteka Národní Knihovna, Truhlář 1970 (X.G.16) (1457), ff. 247v-259v.
- Praha, Knihovna Metropolitní Kapituly, L. XXXVII (1450-1451), ff. 231v-252r (the foliation refers to the whole *Quaestiones* on the *Parva naturalia*).
- Praha, Knihovna Metropolitní Kapituly, M. LXXV (1452-1453), ff. 351r-378r (the foliation refers to the whole *Quaestiones* on the *Parva naturalia*).
- Praha, Knihovna Národního Muzea, X E 5 (1 H 15, 346) (1459-1462), ff. 306r-315r.
- Sankt Florian, Stiftsbibliothek, XI.626 (1452-1454), ff. 205v-222v.
- Schlägl, Stiftsbibliothek, 119 Cpl. (816b) 169 (1453), ff. 259v-271r.

[1018] Colophon (to the *De longitudine et brevitate vitae*): " Et in hoc finitur tota philosophia Arestotelis secundum modum Parisiensium etc. Et est finitum a.D. 1464 in Budissin in vigilia Bartholomei."

31. Marsilius de Inghen (ca. 1340-1396)

Quaestiones super librum De sensu et sensato[1019]

Incipit: "Circa materiam parvorum naturalium, et primo circa librum *De sensu et sensato* quaeritur: Utrum de passionibus et operationibus animatorum ponenda sit scientia distincta a scientia libri *De anima* et scientia de animalibus et scientia de plantis? Et quia in quaestione supponitur quod de operationibus et passionibus sit scientia".

Q. 2: "Utrum omni animali insit gustus et tactus necessarie?"

Q. 3: "Utrum possibile sit aliquod corpus simul totum alterari?"

Explicit: "pro secunda conclusione etc. sequitur."

MSS:

- Berlin, Deutsche Staatsbibliothek-Preussische Kulturbesitz, 976 (Lat. Qu. 71) (1419-1420), ff. 151r-183r.
- † Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° 334, (ca. 1421), ff. 1ra-33rb (possibly, at least in part, a different redaction[1020]).
- Kraków, Biblioteka Jagiellońska, 2117 (1444-1450), ff. 75r-194v[1021].
- Lübeck, Bibliothek der Hansestadt, Lat. 141, item 2.
- München, Bayerische Staatsbibliothek, Clm. 26929 (ca. 1407), ff. 193ra-214rb (possibly a different redaction[1022]).
- Novacella (Neustift), Convento dei Canonici Regolari, 440.
- Oxford, Bodleian Library, Canon. misc. 422 (15th century, Italy).
- Sélestat, Bibliothèque Humaniste, 113 (15th century).
- Solothurn, Zentralbibliothek, S.I.250 (1432), ff. 1r-37v (possibly the same redaction as in ms. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° 334[1023]).
- Uppsala, Universitetsbibliotek, Hs. C.624, ff. 135va-147va.
- † Wien, Österreichische Nationalbibliothek, 4784 (Lunael. O.57) (mid-15th century), ff. 178r-201v (anonymous).

[1019] A critical edition is currently being prepared by Maciej Stanek. Unfortunately, I have not been able to access the text. Q. 3 of the commentary (*Utrum sensus auditus plus ad scientias acquirendas conferat quam sensus visus et quam aliquis aliorum sensuum exteriorum*) has been edited (using only the Erfurt and the Uppsala manuscripts) in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 190-192.

[1020] The *explicit* of the commentary is the following one: "Auctoritas allegata post oppositum est pro dictis in secundo articulo."

[1021] A *tabula quaestionum* of the whole work can be found at ff. 323-324v.

[1022] Incipit: "Circa inicium *Parvorum naturalium* Aristotelis est primo videndum, ex quo noticia *Parvorum naturalium* est pars phylosophie naturalis, tunc propter continuacionem primo est videndum de divisione philosophie naturalis et postea de divisione *Parvorum naturalium* inter se etc. Sciendum ergo pro primo, quod philosophia naturalis convenit dividi in 8 magnas partes". Q. 1 (f. 194ra): "Item dubitatur primo circa istas conclusiones, utrum gustus et tactus sint necessarii omni animali". Expl.: "sensacione propria et simplici istius et sic patet ad dubium illud et sic est finis etc."

[1023] Cf. the *explicit* of the commentary in this manuscript: "auctoritas allegata post oppositum est pro dictis in secundo articulo."

- Wolfenbüttel, Herzog August Bibliothek, 2782 (79.4 4° Aug. Fol.) (ca. 1420-ca. 1450), ff. 128r-147v (anonymous).

32. Matthaeus de Eugubio (Augubio, Ugubio, Gubbio) (d. 1347) (?)

Quaestiones super librum De sensu et sensato

Incipit[1024]: "Circa librum *De sensu et sensato* potest primo quaeri: Utrum oculus videat suum splendorem? Et probatur primo quod non".

Explicit: "antecedit secundum tempus vel secundum naturam."

MSS:

- † Firenze, Biblioteca Medicea Laurenziana, Fesul. (Leopold. Med. Fiesol.) 161 (14th century; not earlier than 1323[1025]), ff. 104r-107r (anonymous)[1026].

[1024] The *incipit* and *explicit* of the commentary are given according to its only known manuscript witness.

[1025] The text, indeed, on f. 104v, makes reference to Aquinas as *Sanctus Thomas* ("Probatur per rationes quattuor Sancti Thome quod visio non fiat extramictendo, sed interrecipiendo"), therefore Aquinas' canonisation in 1323 represents a *terminus post quem* for the dating of the copy of the *De sensu* commentary preserved in this manuscript.

[1026] Note that the attribution of the commentary to Matthew is nowadays mostly rejected by scholars. For information on this manuscript, and also for the most important arguments against an attribution of this commentary to Matthew, see the introduction of A. GHISALBERTI, *Le* Quaestiones de anima *attribuite a Matteo da Gubbio*, Milano, Vita e Pensiero, 1981, which is the edition of a *De anima* commentary contained in the same manuscript and safely attributable to Matthew. For the possible arguments in favour of the attribution of the *De sensu* commentary contained in this manuscript to Matthew, see C. PIANA, "Nuovo contributo allo studio delle correnti dottrinali nell'Università di Bologna nel sec. XIV", *Antonianum* XXIII, 1948, pp. 221-254, esp. p. 225 and pp. 236-243. A full description of the manuscript is included in F. DEL PUNTA, C. LUNA, *Aegidii Romani Opera omnia. I. Catalogo dei manoscritti (96-151). 1/2: Italia (Firenze, Padova, Venezia) (Unione Accademica Nazionale. Corpus Philosophorum Medii Aevi. Testi e Studi 8)*, Firenze, Leo S. Olschki, 1989, pp. 37-49. A list of the *quaestiones* of the *De sensu* commentary contained in the manuscript is included *ibid*. on pp. 43-44. The commentary contains, on the margins of f. 104v, four *quaestiones* based on Albert of Saxony's *Quaestiones* on *Meteorologica* Book III, of which they synthesise four corresponding *quaestiones*. Specifically: *Utrum visus refrangatur a corporibus densis* (f. 104va, corresponding to q. III.1 of Albert's *Quaestiones* on the *Meteorologica*, *Utrum visus refrangatur a corporibus densis*), *Utrum halo fiat per fractionem radii visualis* (f. 104va, corresponding to q. III.4 of Albert's *Quaestiones* on the *Meteorologica*, *Utrum halo fiat per fractionem radii visualis*), *Utrum halo fiat per fractionem ab ipsa nube* (f. 104va, corresponding to q. III.5 of Albert's *Quaetiones* on the *Meteorologica*, *Utrum halo fiat per reflexionem ab ipsa nube*), and *Utrum in visione fiat reflexio a corporibus politis et densis* (f. 104vb, corresponding to q. III.2 of Albert's *Quaestiones* on the *Meteorologica*, *Utrum in visione fiat reflexio a corporibus politis et densis*). The presence of these *quaestiones*, and their source, has been first noted in A. PANZICA, "Un testimone italiano della filosofia naturale di Alberto di Sassonia: i *Marginalia* del Codice Firenze, Biblioteca Medicea Laurenziana, Fesul. 161", *Medioevo. Rivista di storia della filosofia medievale* XLV, 2020, pp. 309-328, pp. 325-326. As Panzica has noted, the *marginalia* of the *De sensu* commentary, presumably written after the main body of the text, are part of a larger set of marginal *quaestiones* that accompany also the commentary on the *Meteorologica* attributed to Matthew of Gubbio (at ff. 73r-84v) and the two anonymous ones on the *De caelo* and on the *De generatione* contained in the same manuscript (respectively, at ff. 43r-52v and at ff. 57r-66v). While the marginal *quaestiones* in the commentary on the *Meteorologica* and those in the commentary on the *De generatione* both correspond to specific *quaestiones* of Albert of Saxony's *Meteorologica* commentary (save for the two *quaestiones* on f. 49 of the *De generatione* commentary, for

33. Nicolaus Oresme (ca. 1320-1382) *sive* Albertus de Saxonia (ca. 1320-1390)

Quaestiones super librum De sensu et sensato

Incipit: "Quaeritur primo circa inicium libri *De sensu et sensato*, utrum scientia de operationibus et passionibus anime et plantarum sit distincta a scientia libri *De anima* et aliorum librorum *De animalibus et plantis*".

Q. 2: "Utrum omni animali sensus tactus et gustus sint necessarii".

Explicit: "Patent ergo tria declarata in generali: primo de naturis organorum sensuum exteriorum; secundo de tribus sensibilibus et eorum generatione, scilicet colore, sapore et odore et qualiter sentiuntur; tertio de actu ipsorum sensuum similiter et sensibilium. Que pauca dicta sint super libro *De sensu et sensato*, salvo sempre in omnibus iudicio meliori, etc."

Editio critica: J. AGRIMI, *Le* Quaestiones de sensu *attribute a Oresme e Alberto di Sassonia (Pubblicazioni della Facolta di lettere e filosofia dell'Universita di Pavia).* Firenze, La Nuova Italia, 1983[1027].

MSS:

- Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 4° 299 (end of the 14th century), ff. 128r-157v (anonymous).
- München, Bayerische Staatsbibliothek, Clm 761 (14th century for the ff. 1-12r, 1378 for the ff. 12r-47v, 1366 for the ff. 49r-85r), ff. 41r-47v (anonymous).
- München, Bayerische Staatsbibliothek, Clm 4376 (1365-1367), ff. 68r-85v (attributed to Albert of Saxony).

34. Nicolaus Tempelfeld de Brzeg (Brega) (1400-1474)

***Exercitium in Parva naturalia* (including *De sensu*)**

Incipit: "Quoniam autem determinatum – Pro aliquali introductione principiorum *Parvorum naturalium* primo est notandum (Sciendum pro aliquali introductorio principio *Parvorum naturalium*), quod potentia sensitiva ipsius animae et potentia vegetativa et secundum locum motiva non exercent suas operationes sine organo corporeo".

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which no direct correspondence has been found in Albert's commentaries), those in the *De caelo* commentary correspond to specific quaestiones of Book II of Albert's commentary on the *De caelo*. All the *marginalia* based on Albert's *Meteorologica* commentary represent the only evidence, at the present state of research, of the circulation of Albert's *Meteorologica* commentary in Italy (whereas the circulation of Albert's *De caelo* commentary in Italy since the 14th century is an already well-known fact).

[1027] For a discussion of the attribution of the commentary, see also J. AGRIMI, *Les* Quaestiones De sensu *attribuées à Albert de Saxe. Quelques remarques sur les rapports entre philosophie naturelle et médecine chez Buridan, Oresme et Albert*, in J. BIARD (éd.), *Itinéraires d'Albert de Saxe. Paris-Vienne au XIVe siècle*, Paris, Vrin, 1991, pp. 191-217.

Q. 1: “Utrum de operationibus et passionibus (communibus) corporum animatorum sit ponenda aliqua scientia distincta a scientia de anima et (a scientia de animalibus et) a scientia de plantis? Notandum quod (Pro quo nota) operationes et passiones corporis et animae sunt sensus seu sensatio, memoria, desiderium, gaudium, ira, tristitia et appetitus et huiusmodi”.

Explicit: “quia sanguis bestiarum est grassus, igitur etc. Explicit liber *De sensu et sensato*, primus inter libros *Parvorum naturalium*. Sequitur iam alter *De memoria et reminiscentia*, circa quem quaeritur, aliter liber *De memoria et reminiscentia* etc.”

MSS:

- Kraków, Biblioteka Jagiellońska, 1903 (1460), ff. 145r-219v.
- Kraków, Biblioteka Jagiellońska, 2086 (1444-1447), ff. 200ra-312ra[1028].
- Kraków, Biblioteka Jagiellońska, 2097 (1451), ff. 1r-102v[1029].
- Kraków, Biblioteka Jagiellońska, 2100 (1450), ff. 221r-286r.

35. Nicolaus Theoderici de Amsterdam (1390-ca. 1438) (?)

Quaestiones circa De sensu et sensato Aristotelis

Incipit: “Utrum de corpore sensitivo animato secundum passiones consequentes communicationem animae et corporis sensitivi sit scientia tamquam de subiecto distincta a scientia libri *De animalibus et plantis* et aliorum librorum *Parvorum naturalium*”.

Q. 2: “Utrum gustus et tactus sint necessarii omni animali”.

Q. 15 (last one): “Utrum possibile sit aliquod totum corpus simul alterari”.

MSS:

- Berlin, Deutsche Staatsbibliothek-Preussischer Kulturbesitz, Magdeburg 62 (15th century), ff. 120v-130v (the text is anonymous, but there is strong evidence for the attribution to Nicholas[1030]).

[1028] Colophon (to the *De physionomia*): "O pie Ihesu Christe, da, ut possiedat vitam eternam scriptor iste etc. 1444 expliciunt *Parva naturalia* per reverendum magistrum Nicolaum de Brega s. theologie doctorem in Studio Cracoviensi compilata, sub commutacione yemali per Johannem de Kl. Scripta. Expliciunt *Parva naturalia*.”

[1029] Explicit: "ante coitum mamillae sunt magis durae, post coitum vero sunt molles propter exitum caloris et spiritus, non potentia eas elevare". A *tabula quaestionum* of the whole work can be found at ff. 201v-202v.

[1030] For the authorship of the text, as well as for details on the other works attributed to Nicholas contained in the same manuscripts, see O. PLUTA, “Nicholas of Amsterdam: Life and Works”, *Bochumer philosophisches Jahrbuch für Antike und Mittelalter* 16, 2013, pp. 185-265, esp. pp. 229-231, where Pluta also provides a list of the questions contained in the text (from which the text of the last *quaestio* of the commentary has been taken).

36. Paulus de Worczyn (1383-1430)[1031]

***Disputata super Parva naturalia* (including *De sensu*)**

Incipit (of the whole work, f. 1r)[1032]: "Circa inicium *Parvorum naturalium* nota, quod in libros *Parvorum naturalium* principaliter determinatur de operacionibus et passionibus animatorum [...] Queritur, utrum de operacionibus et passionibus animatorum sit sciencia et respondetur quod sic ex littera".

Incipit (*De sensu*, f. 3r): "*Quoniam de anima* – Praesens liber convenienter intitulatur *De sensu et sensato*, quia in praesenti libro principaliter determinatur de sensu, id est de operationibus sensitivis".

Q. 1: "Utrum sensus sit operatio communis omnibus animalibus? Ex littera elicitur quod sic".

Q. 2: "Utrum memoria et ira insint omnibus animalibus".

Explicit (*De sensu*, f. 44v): "et sic tunc plus curantur. Et sic est finis *De sensu et sensato*. Et sic consequenter sequitur liber *De memoria et reminiscentia* etc."

Explicit (of the whole work): "Expliciunt *Disputata* reverendi magistri Pauli de Worczyn super *Parva naturalia*, fideliter per ipsum disputata in Studio Cracoviensi et scripta per Nicolaum Spiczmer."

MSS:

- † Kraków, Biblioteka Jagiellońska, 2073 (third quarter of the 15th century), ff. 3v-44r[1033].

37. Petrus de Alvernia (ca. 1240/50-1304)

Quaestiones supra De sensu et sensato

Incipit: "Sicut dicit Philosophus in sexto *Metaphysicae*, tres sunt scientiae speculativae, scilicet naturalis, mathematica, et divina. Divina est de abstractis secundum esse et secundum considerationem; mathematica autem est de abstractis secundum considerationem, coniunctis tamen secundum esse; naturalis autem est de coniunctis secundum esse et considerationem cum materia sensibili, abstractis tamen a materia signata et individuali".

[1031] For an updated introduction to the life and work of Paul of Worczyn see M. PLOTKA, "The Theory of Practice and Action in Paul of Worczyn's Thought", *Revista Española de Filosofía Medieval 27 (2), 2020, pp. 43-58, esp. pp. 44-46.*

[1032] The *incipit* and *explicit* to Worczyn's *Disputata super Parva naturalia*, together with the *incipit* of his *De sensu* commentary, are given according to its only known manuscript witness.

[1033] A *tabula quaestionum* of the whole *Disputata* on *Parva naturalia* can be found at ff. 274r-276r.

Q. 1 (f. 205r): "Utrum universaliter intellectus intelligendo abstrahat a materia".

Explicit: "Ad formam rationis: contrariorum contraria sunt motus; dico quod contrariorum immutationes spirituales non est necesse esse contrarias; contrariorum tamen motus vel immutationes naturales necesse est esse contrarias. Sic ad illam rationem est dicendum."

Colophon: "Expliciunt quaestiones supra *De sensu et sensato* disputatae a magistro Petro de Alvernia. Benedictus Deus. Amen".

Editio critica: K. WHITE, *Two Studies Related to St. Thomas's Commentary on Aristoteles De sensu et sensato together with an Edition of Peter of Auvergne's Quaestiones super Parva naturalia*, Ph.D. thesis, 2 vols., Ottawa, University of Ottawa, 1986[1034].

MSS:

- Oxford, Merton College, 275 (H.3.6) (late 13th-early 14th century), ff. 209-217v (*olim* ff. 205r-213r)[1035].

38. Petrus de Flandria (late 13th century or early 14th century) (?)

Quaestiones super librum De sensu et sensato

Incipit[1036]: "Sicut dicitur X *Ethicorum* inconveniens fiet si homo vitam propriam negligat et vitam alterius eligat. Quod probatur".

Explicit: "secundum diversitatem sue complexionis requirunt alimentum alterius et alterius dispositionis, et forte propter hoc dicitur quod nutriuntur aliquo simplici."

[1034] A revised edition of q. 13 (*Utrum surdi a nativitate sint muti*), and of q. 14 (*Utrum sermo sit naturalis homini*) of the commentary is found in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 152-155.
[1035] The manuscript has been refoliated recently, therefore White's edition refers to the old foliation.
[1036] The *incipit* and *explicit* of the commentary are given according to those of its only known manuscript witness.

MSS:

- † Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170 (late 13th or early 14th century), ff. 117r-131r[1037] (anonymous[1038]).

39. Petrus Wysz de Polonia (first half of the 14th century)

Quaestiones et conclusiones metaphysicae, philosophiae naturalis et totius logicae **(including *Quaestionum responsiones super librum De sensu et sensato Aristotelis*)**

Prologus (ms. Hildesheim): "<P>rima responsio libri *De sensu et sensato*".

Prologus (ms. Göttingen): "*<D>e sensu et sensato*".

Incipit[1039]: "Sentire est proprium omnis (omnis *om. ms. Göttingen*) animalis. Primo quia ex littera".

Explicit: "quod ex isto (illo *ms. Göttingen*) tempore latenti constitueretur totum tempus non latens, quod falsum est de se."

MSS:

- Göttingen, Niedersächsische Staats- und Universitätsbibliothek, Luneb. 63 4° (ca. 1360-ca. 1380), ff. 72v-74v[1040].
- Hildesheim, Dombibliothek, 621 (ca. 1360-ca. 1380), ff. 106v-109r)[1041].
- Kiel, Universitätsbibliothek, Bordesholm 118 (1462), ff. 1r-243v (foliation referring to the whole work)[1042].

[1037] The first three *quaestiones* of the commentary (*Utrum de istis operationibus, puta sentire, memoria et huiusmodi possit esse scientia*, *Utrum de istis sit distincta scientia a scientia de anima*, and *Utrum ira et memoria sint in omnibus animalibus*), together with the proem, have been edited in S. EBBESEN, "Anonymous Vaticani 3061 and Anonymus Vaticani 2170 on Aristotle's *Parva Naturalia*: An Edition of Selected Questiones", *Cahiers de l'Institut du Moyen-Âge Grec et Latin* 86, 2017, 216-312, pp. 295-311. Q. 7 of the commentary (*Utrum surdus naturaliter sit mutus*) has been edited in S. EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *Cahiers de l'Institut du Moyen-Âge Grec et Latin* 86, 2017, 138-215, pp. 170-174.

[1038] The hypothesis of the attribution of the commentary to a master called *Petrus de Flandria* is based on the fact that the *quaestiones* on the *De morte et vita* and on the *De motu animalium* that, in the manuscript, follow those on the *De sensu*, are attributed to this master.

[1039] The *incipit* and *explicit* are given according to those of ms. Hildesheim, Dombibliothek, 621, but any difference with those of of ms. Göttingen, Niedersächsische Staats- und Universitätsbibliothek, Luneb. 63 has been duly noted.

[1040] *Colophon* (to the whole work): "Explicit hic physicae nuclius et logicae in Domini laudem scriptus studii quoque finem".

[1041] *Colophon* (to the whole work): "Expliciunt Conclusiones seu quaestiones librorum metaphysicalium ex dictis They. per Petrum Polonum extortae et compilatae".

[1042] *Colophon* (to the whole work): "Finitae sunt Conclusiones istae A.D. 1462 die sexta mensis iulii in Rostok in collegio artistarum per me Johannem Meyger". Nota <ad De animalibus lib. 19>: "Conclusiones librorum *De anima* cum conclusionibus *Parvorum naturalium*, ceterorum librorum usque ad finem 19 librorum *De animalibus* debent vero et ex alio ordine ordinari ad conclusiones *Meteororum* et de post tunc conclusiones veteris ac novae logicae ordinatae autem sunt".

40. Petrus Tartaretus (ca. 1460-1522)

***Quaestiones supra tota philosophia naturali et metaphysica* (including *De sensu*)**

Incipit (*De Sensu*): "*Quoniam autem de anima* – Iste est liber *De sensu et sensato* Aristotelis, in quo determinat de corpore sensitivo. Et dividitur in novem capitula".

Q. 1: "Queritur: utrum aliquam scientiam oporteat esse preter scientiam librorum *De anima* et librorum *De animailbus et plantis* ad determinandum de operationibus et passionibus animatorum?"

Explicit: "quid sit dicendum ad rationes."

MSS:

- Tübingen, Universitätsbibliothek, Mc 134 (15th century), ff. 244r-252v (anonymous)[1043]

41. Radulphus Brito (ca. 1270-1320/1321) (?)

***Quaestiones super librum De sensu et sensato*[1044]**

Incipit[1045]: "Circa librum *De sensu*, in quo determinatur de operationibus anime in co<m>paratione ad organum, queritur primo utrum de operationibus anime possit esse scientia".

Explicit (ms. Firenze): "patet de sono duorum ad invicem sonantium, quod unus impedit alium."

[1043] The text of the *De sensu* commentary in this ms. (together with those of the other commentaries by Tartaretus contained therein) is (partially?) different from the one printed in the *editio princeps* of the *Quaestiones supra tota philosophia naturali et metaphysica* (Poitiers, 1493), according to LOHR, with the help of COLOMBA, *Latin Aristotle Commentaries I.2. Medieval Authors. M-Z (Corpus Philosophorum Medii Aevi. Subsidia 18)*, *op. cit.*, pp. 106-107. Thus, I provide here the *incipit* and the *explicit* of the *De sensu* commentary in this manuscript. Inc.: "Liber *De sensu et sensato* Aristotelis Nicomaci filii foeliciter incipit. Iste est liber *De sensu et sensato* in quo philosophus determinat de corpore sensitivo et dividitur in novem capitula". Expl.: "patet solutio ex dictis et hec de questione et per consequens *De sensu et sensato* dicta sufficiunt".

[1044] A critical edition is currently being prepared by Iacopo Costa in the framework of an international project aimed at editing most of the Aristotelian commentaries ascribed to Radulphus Brito and headed by Sten Ebbesen. Q. 25 of the commentary (*Utrum duo sensus possint simul et in eodem tempore sentire duo sensibilia*) has been edited in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 176-180. Q. 8 of the commentary (*Utrum surdi a nativitate sint muti*) has been edited in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 161-164.

[1045] The *incipit* of the commentary is that of ms. Firenze, BNC, Conv. Soppr. E.I.252, but the text is the same as that of the *incipit* of ms. Leipzig, Universitätsbibliothek, 1150.

Explicit (ms. Leipzig): “quia sicut 3° *De anima* natura nichil facit frustra; modo passiva talis est ordinata naturaliter ad actum, ergo natura (?) actus est terminus; possibilis esset actus”.

MSS:

- † Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. E.I.252 (14th century), ff. 207r-214v (anonymous, but the attribution is extremely probable[1046]).
- † Leipzig, Universitätsbibliothek, 1150 (13th-14th century), ff. 126r-133v (anonymous and incomplete)[1047].

[1046] For what concerns the attribution of the commentary to Brito (taking into account only the ms. Firenze, BNC, Conv. Soppr. E.I.252), see especially COSTA, *Il commento di Radulfo Brito all'Etica Nicomachea,: edizione critica del testo con uno studio critico, storico e dottrinale*, *op. cit.*, pp. 354-363.

[1047] I have recently discovered that this manuscript contains the same text of ms. Firenze, BNC, Conv. Soppr. E.I.252, ff. 207r-214v. No mention of it, as far as I know, is present in the secondary literature devoted to the *De sensu* commentary attributed to Brito.

Anonymous Commentaries

A. Literal Commentaries

42. Basel, Universitätsbibliothek, F.V.10 (ca. 1343), ff. 96r-107r (ff. 57r-68r, according to the old foliation). *In De sensu*.
Incipit: "Ut quid in nostri exilii solitudines, o philosophia delapsa a supero cardine, venisti. Non enim est, scilicet dicit, Non enim est fas philosophiae, ut iter dimittat incomitatum innocentis. Hanc propositionem scribit Boethius in libro *De consolatione philosophiae*. In qua propositione *Quoniam autem de anima*. Iste liber cuius subiectum est sensus et sensibile, ut ipse sensus respicit ipsum corpus, in quo corpore exercet suas operationes, prima divisione dividitur in tractatus duos. Primus est tamquam prooemium huius libri, secundus est ut executio. Secundus incipit ibi, *Sed de sensu*".
Explicit: "hic epilogat et dicit ea quae tenentur in littera et hoc continuando se ad librum sequentem. Explicit liber *De sensu et sensato*. Deo gratias."

43. Basel, Universitätsbiblitohek, F.II.6, ff. 128r-145r. *De sensu*, "per quendam magistrum parisiensem de graeco in latinum translati (cum commento anonimo)[1048]".
Incipit (to the whole *Parva naturalia*): "Circa initium *Parvorum naturalium* videndum est: Quid sit subiectum *Parvorum naturalium*".
Incipit (*In De sensu*): "Iste liber cuius subiectum visus est dividitur in duos tractatus".
Explicit (*In De sensu*): "sicut est de aliis potentiis. Sequitur tractatus secundus *De memoria et reminiscentia*."

44. Cesena, Biblioteca Malatestiana, Plut. VI, sin. 5, ff. 161v-163r. *In De sensu*.

45. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 13326 (*olim* 817A) (13th-14th century), ff. 50r-54v[1049]. *Sentencia libri De sensu et sensato*.
Incipit: "*Quoniam autem de anima* etc. Secundum assercionem Commentatoris et magistrorum sentencias, in hoc libro est intencio de quibusdam propriis soli animali, ut de sensu et sensato, de quibus etiam determinatum est in libro *De anima*, alio tamen modo quam hic, quia ibi determinatum est de eis secundum

[1048] Cf. C.H. LOHR, *Aristotelica Helvetica catalogus codicum latinorum in bibliothecis Confederationis Helveticae asservatorum quibus versiones expositionesque operum Aristotiles continentur (Scrinium Friburgense 6)*, Berlin, de Gruyter, 2018², pp. 47-49.

[1049] On this commentary, cf. THOMAS DE AQUINO, *Sancti Thomae de Aquino Sentencia libri De sensu et sensato cuius secundus tractatus est De memoria et reminiscencia*, ed. GAUTHIER, *op. cit.*, pp. 121*-122*. Gauthier firmly believes that the author of the *De sensu* commentary preserved in this manuscript is a disciple of Adam of Buckfield, one who is maybe also influenced by the author of the anonymous glosses to the *translatio vetus* preserved in ms. Paris, Bibliothèque nationale de France, Lat. 16635, ff. 86v-88r, and in ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Urb. Lat. 206, ff. 318r-334v (cf. *infra*). Moreover, Gauthier believes that the author of this commentary is the same as the author of the *Metaphysics* commentary preserved in ms. Milano, Biblioteca Ambrosiana, H.105.Inf., ff. 60r-73r, and in ms. Oxford, Merton College, 272, ff. 37r-43v.

ordinem quem habent ad invicem, scilicet secundum quod sensus natura est inmutari a sensibilibus et sensibile natum est inmutare sensum, et hoc presente sensibili, in libro vero *De sompno et vigilia* in quantum inmutatur in absencia sensibilis".
Explicit: "Solucio autem secunde racionis patet secundo *De anima*, quia, cum sensus est receptivus specierum sensibilium sine materia, suscipit eas sine contrarietate, quia contrarietas est in materia. Explicit sentencia libri *De sensu et sensato*."

46. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, CA 4° 317 (15th century), ff. 78r-99v. *Commentarius in Aristotelis libros Parvorum naturalium* (including *De sensu*).
Incipit: "*Quoniam de anima secundum*. Sciendum est quod ex ista littera habetur talis conclusio: quod de operacionibus".
Explicit: "habent distinccionem – sequitur de respiracione. Sequitur alius lib. de resp."

47. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, CA 4° 323 (mid-15th century), ff. 178v-192r. *Expositio libri De sensu et sensato Aristotelis*.
Prologus: "*Lumen lune, si non eset* (*sic!*)*, et aliarum stellarum multa animalia de nocte ambulancia perirent*. Hanc proposicionem scribit Philosophus in libro *De animalibus* et videtur".
Incipit: "Iste liber, qui intitulatur *De sensu et sensato*, cuius subiectum est hoc complexum anima".
Explicit: "ad quam perducat nos ille, qui sine fine vivit et regnat in seculorum secula etc. Sequitur secundus liber."

48. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° 338 (15th century), ff. 10v-14r. *Expositio libri De sensu et sensato Aristotelis cum textu abbreviato*.
Prologus: "Pro recommendacione philosophie naturalis hic assumitur ista proposicio: *Noster intellectus non debet esse vanus sed circa virtutes*. Illam proposicionem scribit Eustracium super *Ethicorum* quarto et potest sic exponi".
Incipit: "*Quoniam < de anima secundum se determinatum est in libro "De anima" > etc.* – Iste liber, qui communiter intytulatur *De sensu et sensato*, cuius quatuor sunt cause".
Explicit: "et per consequens in tali distancia indivisibile non sentitur."

49. Göttingen, Niedersächsische Staats- und Universitätsbibliothek, Luneb. 7 2° (1339-1366), ff. 143r-159r. *Expositio libri De sensu et sensato Aristotelis*.
Incipit: "*De primis igitur*. Iste liber sicut alii libri habet quatuor causas, scilicet efficientem".
Explicit: "est in libris *De anima* et post ista dicta consideratur *De memoria et reminiscencia* et eciam *De sompno et vigilia* et cetera. Expliciunt reportata super librum *De sensu et sensato* per manus Conradi in Erfordia. Deo laus et honor."

50. Kraków, Biblioteka Jagiellońska, 1982 (second quarter of the 15th century), ff. 1r-83v. *Expositio librorum Parvorum naturalium Aristotelis cum textu eiusdem* (*De sensu et sensato, De memoria et reminiscentia, De somno et vigilia, De*

longitudine et brevitate vitae, De iuventute et senectute, De respiratione et inspiratione, De motibus animalium, De mundo, De motu cordis id est cap. ultimum De vita et morte). *Expositio* on the *De sensu* at ff. 3r-39v.
Incipit (to the whole work): "*Plantaverat autem Dominus Deus paradysum voluptatis a principio, in quo posuit hominem* [*Gen*. 2,8]. Ista verba scripsit *Genesis* primo historialiter, sed tamen possunt allegorice pro recommendacione philosophie ad propositum aperte introduci".
Incipit (*De sensu*): "*Quoniam de anima secundum se determinatum est*. Iste est primus liber *Parvorum naturalium* qui".
Explicit: "penitus non videtur."
Explicit (*De vita et morte*): "si saltem debite se rexerit secundum diccionem recte racionis et istum peryodum habet homo a Deo glorioso, cuius nomen sit benedictum in secula. Amen."

51. Kraków, Biblioteka Jagiellońska, 2179 (1416), ff. 147v-166v. *Expositio librorum Parvorum naturalium Aristotelis cum textu eiusdem* (*De sensu et sensato*, *De memoria et reminiscentia*).
Incipit (*De sensu et sensato*): "Circa inicium *De sensu et sensato*, ex quo presens liber est philosophicalis, tunc videndum est, quid sit philosophia".
Explicit (*De memoria et reminiscentia*): "ponat tercio, ut frequenter meditetur secundum ordinem, quarto, ut incipiat reminisci a principio."

52. Leipzig, Universitätsbibliothek, 1348 (1451-1471), ff. 76v-77r. *Lectiones 1-14 super librum De sensu et sensato Aristotelis*.
Prologus: "Liber *De sensu et sensato* in subsequentes dividitur lecciones. Leccio prima".
Incipit: "*Quoniam autem de anima secundum ipsam terminatum est et cetera*. Ubi Aristoteles recommendando ea que dicta sunt in libro *De anima* incipit agere".
Explicit: "ubi Aristoteles excludit unam falsam solucionem questionis prenarrate."
Colophon: "Et sic completur liber *De sensu et sensto* 14 leccionibus".

53. Oxford, Bodleian Library, Digby, 55 (13th century), ff. 22r-25v. *Commentarium in De sensu*.
Incipit: "*Quoniam autem*…; Dictum est in libro *De anima* quid sit anima in communi et etiam de unaquaque".
Explicit: "sequitur necessario idem esse sensile (*sic!*) et insensile (*sic!*). Explicit."

54. Oxford, Bodleian Library, Digby, 150, ff. 32-34. *Fragmentum ex abbreviatione tractatus De sensu*[1050].

55. Paris, Bibliothèque Mazarine, 3473 (end of the 13th century-beginning of the 14th century), ff. 123ra-123vb. *Commentarius in De sensu et sensato Aristotelis*.
Incipit: "Virtutes inquit sensibiles quedam sunt necessarie in esse animalis et quedam sunt propter melius".

[1050] The text is an *abbreviatio* of Albert's *De sensu* commentary (cf. ALBERTUS MAGNUS, *Alberti Magni Ordinis Fratrum Praedicatorum De nutrimento et nutrito. De sensu et sensato cuius secundus liber est De memoria et reminiscentia*, ed. DONATI, *op. cit.*, p. LIII).

Explicit (f. 123vb): “loquendum est de eo in secundo tractatu.”

56. Paris, Bibliothèque nationale de France, Lat. 6747 (end of the 15th century-beginning of the 16th century), ff. 1r-31v. *In De sensu et sensato Aristotelis expositio*.
Prooemium: “Vere teipsum felicem scies, si ea bona intellexeris, quibus virtus fuerat admissa, ita scribit Seneca in libro suo *De moribus*; in quibus verbis nos ad studium philosophie prosequendum hortatur propter tria. Primo propter eius delectabilitatem, secundo propter eius dignitatem ac honestatem, tertio propter eius nobilitatem”.
Incipit (f. 3r): “*Quoniam de anima*. Iste liber qui communiter *de Sensu et sensato* intitulatur ex prima sui divisione dividitur in tot capitula quot in registro explicantur. Que capitula in processu plenius patebunt. Sed capitulum primum dividitur in partem prohemialem et executivam”.
F. 3v: “*Sunt autem talia*. Secunda particula partis prohemialis in qua incipit enumerare illas passiones que sunt communes corpori et anime”.
F. 5r: “Sed circa sensum tactus moventur quedam problemata: primum: si aliquod membrum animalis fortiter ligatur in extremitate quamvis tamen per sensibile accidens causatur vix sentitur”.
F.6r: “Circa presentem lecturam moventur talia problemata. Primum: Quare homines surdi, ut frequenter, loquuntur per nasum”.
F. 30v: “*Quoniam autem*. Capitulum ultimum illius libri in quo exequitur declarando quo modo debet se habere obiectum sensus ad sensuum”.
F. 31v: “Circa quod dubitatur, utrum tempus sit sensibile, et videtur quod sic”.
Explicit (f. 31v): “et quod per se immutat organum sensus sicut motus, quia aliter sentitur album prout comparatur ad principium et aliter prout comparatur ad finem diei. Et sic est finis De sensu et sensato. Amen.”

57. Paris, Bibliothèque nationale de France, Lat. 16222 (14th century, before 1338), ff. 40r-41v. *In De sensu et sensato* (fragment).
Incipit: “|| Virtutem sensitivarum quedam sunt necessarie propter esse animalis et quedam sunt propter melius esse ipsius”.
Explicit: “sunt maioris intellectus et melioris comprehensionis. Hec igitur est summa eorum que dicenda erant in hoc tractatu.”

58. Praha, Biblioteka Národní Knihovna, Truhlář 527 (III.G.2) (15th century), ff. 244r-260v. *Commentarius libri De sensu et sensato Aristotelis*.
Incipit (to the whole *Parva naturalia*): “Circa inicium *Parvorum librorum naturalium* est sciendum, quod sciencia illorum librorum dicitur parvorum naturalium non quod in se sit parva, sed quia magis descendit ad particularia quam sciencia tradita in magnis libris naturalium, eo quod sciencia parvorum naturalium tradita est in parvis libellis”. F. 244vb: “*Quoniam de anima determinatum est*. Iste liber convenienter intitulatur *De sensu et sensato* cuius subiectum est hec extrinseca anima considerata <in se> et in suas passiones”.
Explicit (to the whole *Parva naturalia*): “quia invisibile nullam proportionem habet ad distentiam (?) finitam, postquam a sensu percipitur, igitur per cuius non sentitur.”

B. Question Commentaries

59. Aberdeen, University Library, 110 (15th century), ff. 218r-223v[1051]. *Copulata* (of *quaestiones non disputatae*) *in De sensu et sensato*.
Incipit: "Circa initium libri *De sensu et sensato* quaeritur: De quo determinatur in libro *De sensu et sensato*? Dicendum est quod de ipsa anima".
Q. 2: "Quaeritur: Quare isti libri vocantur libri *Parvorum naturalium*".
Explicit: "esse contraria iudicium rerum."

60. Basel, Universitätsbibliothek, F.I.13 (15th century), ff. 193r-209v. *Quaestiones in De sensu et sensato* < *de lectura Ioannis Versoris*>.
Incipit: "Circa initium librorum *Parvorum naturalium* quaeritur primo: Utrum corpus animatum sit subiectum in libris *Parvorum naturalium* et corpus sensitivum in hoc libro *De sensu*? Arguitur primo quod non quia omnes passiones corporis animati sunt ab anima vegetativa et sensitiva vel intellectiva".
Q. 2: "Utrum omnes sensus exteriores sunt necessarii omni animali".
Explicit: "quod partim videbitur et partim non. Et sic indivisibile habebit partes. Quod est impossibile. Et hoc de quaestione. Rationes ante oppositum solvuntur ex dictis. Et sic est finis [...] et per consequens de toto libro *De sensu et sensato* etc. Deo gratias." "Recapitulatio huius libri de sensu et sensato", "quod suppositum erat et nondum probatum. Et finaliter epilogat dicta in libro. Et sic finitur liber *De sensu et sensato*. Deo gratias. Et sic est finis."

61. † Città del Vaticano, Biblioteca Apostolica Vaticana, Vat Lat. 721 (14th century), ff. 53r-58v. *Dicta super De sensu* (*Quaestiones*).
Incipit: "*Quoniam autem de anima*. In isto libro sunt tractata [...] requisita. Primo causa".

62. † Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3061 (around 1300), ff. 145r-150r[1052]. *Quaestiones super librum De sensu et sensato*[1053].
Incipit: "Sicut dicit Ptolomeus in principio Almagesti, inter homines ille est excellentior qui non curat in cuius manu sit mundus".

[1051] On the authorship and origin of this commentary, as well as on the relation it bears to the commentaries by Petrus de Rivo (whose *Expositio* on the *De sensu* is contained in the same manuscript) see MASOLINI, "Two Commentaries on the *De sensu et sensato* from Fifteenth-Century Louvain", *op. cit.* According to Masolini, the anonymous *copulata* of *quaestiones non disputate* on the *De sensu* preserved in this manuscript not only show a strong connection to Rivo's commentary, which is also present in the same manuscript, but they represent the only other extant commentary on the *De sensu* produced at Leuven's Faculty of Arts during the 15th century.

[1052] The commentary shows strong similarities with the one ascribed to Radulphus Brito (cf. EBBESEN, THOMSEN THÖRNQVIST, DECAIX, "Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue", *op. cit.*, p. 73), and Chapter 4 in the present thesis.

[1053] The first three *quaestiones* of the commentary (*Utrum de operationibus, animae possit esse scientia*, *Utrum de sensu et sensato sit scientia*, and *Utrum ira et memoria insint omnibus animalibus*), together with the proem, have been edited in EBBESEN, "Anonymous Vaticani 3061 and Anonymus Vaticani 2170 on Aristotle's *Parva Naturalia*: An Edition of Selected Questiones", *op. cit.*, pp. 228-243. Q. 7 (*Utrum surdus sit naturaliter mutus*), and q. 8 (*Utrum si aliquis puer sit positus in nemore a principio suae nativitatis debeat loqui idioma determinatum*) of the commentary have been edited in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 164-170.

Explicit: "Ad aliud dicendum quod non est simile dare ultimum instantis cum non sit ultimum corpus, ut patet secundum Philosophum, et ideo in eodem instanti in quo medium fuit illuminatum et tenebrosum (?); ideo etc."

63. Colmar, Bibliothèque Municipale, 377 (233) (15th century), ff. 276r-291r. *Quaestiones super librum De sensu et sensato*.
Incipit: "*Determinatum est de anima secundum se* – Circa initium libri *De sensu et sensato* Aristotelis peripateticorum secte <principis> queritur primo: Utrum corpus sensitivum sit adequatum libri *De sensu et sensato* subiectum? Arguitur primo quod non, quia pargorum (?) est aliquid".
Q. 2: "Quaeritur: Utrum homines habeant peiorem odoratum ceteris animalibus".
Last *dubium*: "Utrum duo sensibilia eiusdem speciei possint simul percipi ab eadem potentia".
Explicit: "qualitatum sensibilium. Et haec de questione et per consequens de libro *De sensu et sensato*."

64. † Eichstätt, Universitätsbibliothek, Cod. st 565, ff. 27r-28v. *Puncta super libros Parvorum Naturalium Aristotelis secundum Quaestiones Marsilii de Inghen* (incomplete)[1054].

65. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° 338 (15th century), ff. 103r-120r. *Quaestiones super librum De sensu et sensato Aristotelis*[1055].
Incipit: "<C>irca inicium librorum *Parvorum naturalium* queritur primo, utrum sit ponenda aliqua determinacio scientifica de passionibus et proprietatibus animatorum distincta a sciencia libri *De anima* et a sciencia libri *De animalibus et plantis* et ita de aliis libris philosophie naturalis sive scienciis eorundem, que pertinent ad parvulos libros naturales. Ista questio unum presupponit et aliud querit".
Explicit: "Auctoritas allegata post oppositum est pro dictis in secundo articulo. Hec de questione et per consequens de questionibus solitis legi circa librum *De sensu et sensato* etc."

66. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 4° 387a (before 1434), ff. 109vb-113ra. *Puncta Erffordiensia super librum De sensu et sensato Aristotelis*.
Incipit: "Circa librum *De sensu et sensato* libri (*sic!*) *Parvorum naturalium* questio prima, de quibus determinetur in libris *Parvorum naturalium*. – Queritur, de quibus determinetur in *Parvis naturalibus*, respondetur, quod in eis determinatur de passionibus et operacionibus ipsorum animatorum".

[1054] Only the *quaestiones* of the *De sensu* are summarised in the text, apart from two quaestiones on the *De memoria* (cf. f. 29r), although at the beginning (cf. ff. 27r-27v) there are also the lists of *quaestiones* to the *De memoria et reminiscentia* and to the *De somno et vigilia*. The last *quaestio* on the *De sensu* summarised is *Utrum subiectum coloris sit perspicuum vel opacum* (cf. ff. 28r-28v).

[1055] Based on the *incipit* and the *explicit*, the *Quaestiones* on the *De sensu* contained in this manuscript appear to be the same as those contained in ms. Lüneburg, Ratsbücherei, Theol. 2° 44 (ca. 1446), ff. 234r-286r (cf. *infra*). Moreover, based on these same *incipit* and *explicit*, the commentaries contained in these two manuscripts might represent other two witnesses of the *Quaestiones* on the *De sensu* attributed to Marsilius of Inghen.

Explicit: “quia tales sunt operaciones ad sciencias speculativas, que sunt perfecciones scienciis practicis et manualibus. Expliciunt puncta libri *De sensu et sensato*.”

67. Göttingen, Niedersächsische Staats- und Universitätsbibliothek, Luneburg 7 2° (1339-1366), ff. 213v-218r. *Quaestiones super librum De sensu et sensato Aristotelis*.
Incipit: “Queritur circa librum *De sensu et sensato* primo utrum de passionibus sicut de sompno et vigilia et huiusmodi est sciencia. Et videtur quod non”.
Explicit: “tamen non oportet he plura agencia habencia diversum modum agendi. Expliciunt questiones super *De sensu et sensato* complete in Arnstede.”

68. Kraków, Biblioteka Jagiellońska, 704 (14th century), ff. 69ra-69rb. *Puncta secundum Joannem Buridanum in librum De sensu et sensato Aristotelis* (qq. 2-6 of the first *recensio* of Buridan’s *Quaestiones*, abbreviated)[1056].
Incipit: “Utrum omni animali fuit necessarium gustus et tactus? Solvitur prenotando, quod necessarium uno modo dicitur, quod simpliciter impossibile est”.
Explicit: “et sic auditur et tortuositates sunt, ideo nec ex violencia soni frangatur pellicula, sed tortuositates reverberant.”

69. Kraków, Biblioteka Jagiellońska, 1898 (15th century), ff. 1r-125v. *Quaestiones Cracovienses (?) in libros Parvorum naturalium Aristotelis* (*De sensu et sensato*, *De memoria et reminiscentia*, *De somno et vigilia*, *De longitudine et brevitate vitae*, Costa ben Luca's *De differentia spiritus et anime*, *De vita et morte*, *De respiratione et inspiratione*, *De iuventute et senectute*, *De motu cordis*, id est cap. ultimum *De vita et morte*).
Incipit (*De sensu*): “Queritur circa libros *Parvorum naturalium*, utrum sciencia de operacionibus et passionibus anime sit distincta a sciencia libri *De anima* et aliorum librorum *De animalibus et plantis*”.
Explicit (*De vita et morte*): “et quia homo inter omnia inferiora plus participat de bonitate et ideo inter omnia debet eum laudare in secula s<e>culorum. Amen.”

70. Kraków, Biblioteka Jagiellońska, 1946 (second-third quarter of the 15th century; no earlier than 1458), ff. 151v-152v. *Puncta in De sensu et sensato Aristotelis secundum Nicholaum Tempelfeld de Brega*.
Incipit: “Sequitur liber *De sensu et sensato* etc. Sequitur liber *De sensu et sensato*. (*sic!*) Notandum est. Organum olfactus est quaedam subtilis cart<il>ago situata in extremitate nasi iuxta cerebrum”.
Explicit: “Et sic est aeterna entitative et non subiective[1057].”

[1056] On this commentary, see M. ZWIERCAN, “*Quaestiones brevissimae super librum De sensu et sensato* et *Quaestiones super Parva naturalia* de Jean Buridan dans les manuscrits de la Bibliothèque Jagellonne (Supplément au catalogue des oeuvres de Jean Buridan)”, *op. cit.*
[1057] On the *Puncta* on the *Parva naturalia* contained in this manuscript, and for an edition of them, see M. STANEK, “Puncta ex commentario Nicolai Tempelfeld de Brzeg in Parva naturalia: Editio critica”, *Przeglad Tomysticzny* XXIV, 2018, pp. 289-319, pp. 311-315.

71. Kraków, Biblioteka Jagiellońska, 2179 (1416), ff. 99r-100r. *Problemata Parvorum naturalium* (including the *De sensu*)[1058].
Incipit: "Incipiunt problemata *Parvorum naturalium*, quamvis non sunt de essentia questionis, scilicet utrum ceci a nativitate etc."
Problema 1 (f. 99r): "Primum problema: quare aures sunt a diversis partibus posite et non ab una parte sicut oculi?"
Explicit: "quia calidi est aperire et frigidi constringere, ideo calida fetent."

72. Lüneburg, Ratsbücherei, Theol. 2° 99 (ca. 1400-ca. 1460), ff. 21r-27r. *Quaestiones super librum De sensu et sensato Aristotelis*.
Incipit: "Utrum de sensu et sensato sit sciencia distincta ab aliis libris philosophie naturalis? Arguitur quod non".
Explicit: "ut satis ad longum habetur in textu. Raciones ante oppositum solute sunt."
Colophon: "Et sic est finis huius libri *De sensu et sensato*. Sequitur *De memoria et reminiscencia*".

73. Lüneburg, Ratsbücherei, Theol. 2° 44 (ca. 1446), ff. 234r-286r. *Quaestiones super librum De sensu et sensato Aristotelis*[1059].
Incipit: "Circa inicium *Parvorum naturalium* et primo circa librum *De sensu et sensato* queritur utrum sit ponenda aliqua declaracio scientifica de passionibus et proprietatibus animatorum distincta a sciencia libri *De animalibus* et similiter et ita de aliis libris philosophie naturalis seu sciencia eorum que pertinent ad parvos libros naturales. Ista questio unum presupponit et aliud querit".
Explicit: "Auctoritas allegata post oppositum est pro dictis in secundo articulo. Hec de questione ista et per consequens de questionibus solitis legere circa librum *De sensu et sensato*."

74. † München, Bayerische Staatsbibliothek, Clm. 19818 (1439), ff. 135r-168r. *Puncta Wiennensia super librum De sensu et sensato Aristotelis*.
Incipit: "*Quoniam autem de anima* etc. – Iste liber intitulatur *De sensu et sensato* et est liber *Parvorum naturalium* [...] Utrum de passionibus et operacionibus animatorum ponenda sit sciencia distincta a sciencia de anima, de animalibus et de plantis? Hec est questio prima Marsilii".
Explicit: "sunt ita calide, per quas exit sudor sicut in hoc sono etc."

75. München, Bayerische Staatsbibliothek, Clm. 19850 (ca. 1447 for the ff. 1r-12r, 1430 for the ff. 57r-104v, ca. 1430 for the ff. 105r-139r, after 1430 for the ff. 141r-

[1058] An edition of these *Problemata*, which probably date to the beginning of the 15th century and which are also found in two manuscript witnesses of *recensio I* of Buridan's *Quaestiones*, namely ms. Klagenfurt, Bischöfliche Bibliothek, XXXI.b.5 and ms. München, Bayersiche Staatsbibliothek, Clm. 18248, has been published, as already said, in STANEK, "*Problemata Parvorum naturalium*: An Anonymous Supplement to John Buridan's Commentary on the *Parva naturalia*", *op. cit.*

[1059] Based on the *incipit* and the *explicit*, the *Quaestiones* on the *De sensu* contained in this manuscript appear to be the same as those contained in ms. Erfurt, Universitätsbibliothek, Bibliotheca Amploniana, 2° 338 (15th century), ff. 103r-120r (cf. *supra*). Moreover, based on these same *incipit* and *explicit*, the commentaries contained in these two manuscripts might represent other two witnesses of the *Quaestiones* on the *De sensu* attributed to Marsilius of Inghen.

217r), ff. 105r-125r. *Quaestiones Wiennenses super librum De sensu et sensato Aristotelis*.
Incipit: "Circa inicium *Parvorum naturalium* queritur primo, utrum de passionibus et operacionibus animatorum ponenda est sciencia distincta a sciencia librorum *De anima* et a sciencia libri *De animalibus et plantis*".
Explicit: "sed ad sensum secunde, quarte et prime questionis est vera. Et sic est finis huius libri."

76. München, Bayerische Staatsbibliothek, Clm. 12257 (1448), ff. 135v-147v. *Quaestiones Wiennenses (?) super librum De sensu et sensato Aristotelis*.
Incipit: "*Quoniam autem de anima*. – Iste liber intitulatur liber *De sensu et sensato* et eciam liber *Parvorum naturalium* [...] Utrum de passionibus et operacionibus animatorum ponenda sit sciencia distincta a sciencia de anima, de animalibus et de plantis. Hec est questio prima Marsilii et ponit tres articulos".
Explicit: "contrahit sibi salsedinem. Finis huius *De sensu et sensato*, anno Domini M °CCCC°XLVIII° etc."

77. München, Bayerische Staatsbibliothek, 8942 (mid-15th century), ff. 129r-139r. *Quaestiones super librum De sensu et sensato Aristotelis*.
Incipit: "<C>irca librum *De sensu et sensato*, qui incipit: *Quoniam autem*, nota, quod iste liber intitulatur *De sensu et sensato* et eciam <liber> *Parvorum naturalium* [...] Utrum de passionibus et operacionibus animatorum ponenda sit sciencia distincta a sciencia libri *De anima* et a sciencia de plantis et hec est questio prima Marsilii et ponit tres articulos. Primus erit de supposito, secundus de quesito, tercius de quolibet. Notandum, quod ille terminus passio".
Explicit: "ibi possunt formari probleumata, qui in *De anima* per modum corellarii communiter terminabitur. Et sic est finis huius."

78. Oxford, Bodleian Library, Digby, 44 (15th century, England), ff. 34v-86v. *Questiones super librum De sensu et sensato*[1060].
Incipit: "Incipiunt questiones super librum *De sensu et sensato*. Queritur primo utrum de operacionibus et passionibus [in]animatorum sit sciencia distincta a scientia libri *De anima* et aliorum librorum naturalium".
F. 77v: "que sunt penitus sine caliditate. Nota quod iste 4. questiones ultime non eiusdem doctoris cuius sunt omnes alie ut patet <per> modum procedendi sed tamen suplent vicem. Nam deest finis questionis decime et etiam deest questio undecima totaliter et principium questionis duodecime et ideo ille 4. predicte non numerantur inter questiones huius libri ut patet in tabula eiusdem[1061]".
F. 78: "Ex quo sequitur correlate que species odoris realis dicitur odor specialis".
Explicit: "Dicta post oppositum sunt pro secunda questione primi articuli.

[1060] An attribution to John Spengen or to John Versoris is possible.
[1061] Cf. R.M. THOMSON, *Catalogue of Medieval Manuscripts of Latin Commentaries on Aristotle in British Libraries. Vol. I: Oxford*, Turnhout, Brepols, 2011, p. 330: "Q. 10 breaks off unfinished on 74; 74v-75 are blank. At the head of 76v (q. 11 having occupied 75v-76) Saundyre writes: "Questiones subsequentes tres non sunt de substantia huius libri". Note the discrepancy in the number."

Expliciunt questiones super libros *De sensu et sensato* secundum magistrum Iohannem Parisiensem, dictum Spengen, scripte a Domino Iohanne Saundre[1062]."

79. † Oxford, Oriel College, 33 (late 13th or early 14th century), ff. 192-197v, *Quaestiones super librum De sensu et sensato*[1063] (incomplete at end).
Incipit: "[*Q*]*uoniam autem de anima*…; Queritur utrum de sensu et sensato sit scientia sive tractatus et distincta ab ista que traditur in libro *De anima*".
Explicit: "Ideo si non habeat actionem propter defectum passivi non oportet auferre formam. Per hoc dicendum est ad tertiam rationem", then an addition by William Griffith ("hec scripsi ut compleatur questio [...] Griffith"): "potest dici quod sicut aliquid […] non habet actionem sensibilis non dicetur sensibile, ut patet."

80. † Paris, Bibliothèque nationale de France, Lat. 16160 (around 1300, before 1310), ff. 109r-118r. *Quaestiones super librum De sensu et sensato*[1064].
Incipit: "Supposita divisione liberalis (*sic!*) philosophie consequenter queritur supra librum *De sensu et sensato,* et primo utrum de sensu et sensato possit esse scientia, et cum hoc videbitur, utrum sit distincta a scientia libri *De anima*. De primo arguitur quod de sensu et sensato non possit esse scientia, quia de eo quod est principium scientie non sit scientia".
Q. 2 (f. 109rb): "Consequenter queritur, utrum ira et memoria insit omnibus animalibus et post, utrum tactus insit omnibus animalibus et post de aliis. De primo arguitur de memoria, quod memoria sit ex sensu".
Last *quaestio* (f. 118va): "Consequenter queritur, utrum sensus communis sit unus sensus, arguitur quod non".
Explicit: "sed differunt per essentiam et formam; sed sensus communis est unus essentialiter et differens solum secundum rationes accidentales diversas, et sic non valet quod dixerunt. Et ista de libro *De sensu et sensato* sufficiant."

81. Praha, Knihovna Metropolitní Kapituly, M.LXXX (late 13th-early 14th century), ff. 131v-132v. *Fragmentum ex commentario super De sensu et sensato* (12 *dubitationes* on the first chapter of the *De sensu*)[1065].

[1062] Cf. THOMSON, *Catalogue of Medieval Manuscripts of Latin Commentaries on Aristotle in British Libraries. Vol. I: Oxford, op. cit.*, p. 330: "The *quaestiones* are numbered 12-15, and are presumably the material lacking from the previous article, since q. 12 lacks its beginning."

[1063] Q. 5 of the commentary (*Utrum surdus a nativitate sit mutus*) has been edited in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 174-177. For some remarks on the manuscript, cf. S. EBBESEN, "Anonymus Orielensis 33 on *De memoria*. An Edition", *Cahiers de l'Institut du Moyen-Âge Grec et Latin* 85, 2016, pp. 128-161.

[1064] For some remarks on the manuscript, cf. S. EBBESEN, "Anonymus Parisini 16160 On Memory. An Edition", *Cahiers de l'Institut du Moyen-Âge Grec et Latin* 85, 2016, pp. 162-217. Q. 35 of the commentary (*Utrum unus sensus possit simul contraria*), q. 36 (*Utrum sensus sentiens diversa sensibilia simul ipsa sentiat una sensatione vel pluribus; secundo utrum sensus communis qui cognoscit diversa sensibilia, sit unus*) and q. 37 (*Utrum sensus communis sit unus sensus*) have been edited in TOIVANEN, "Medieval Commentators on Simultaneous Perception: An Edition of Commentaries on Aristotle's *De sensu et sensato* 7", *op. cit.*, pp. 181-188. Q. 4 (*Utrum visus plus conferat ad scientiam quam auditus*) and q. 5 (*Utrum surdi a nativitate sunt muti naturaliter*) of the commentary have been edited in EBBESEN, "Does Language Acquisition Depend on Hearing a Language? A Text Corpus", *op. cit.*, pp. 157-161.

[1065] On this text, cf. EBBESEN, THOMSEN THÖRNQVIST, DECAIX, "Questions on *De sensu et sensato, De memoria* and *De somno et vigilia*. A Catalogue", *op. cit.*, p. 60.

82. † Roma, Biblioteca dell'Accademia dei Lincei e Corsiniana, 36.F.6 (Rossi 415) (end of the 14th century-beginning of the 15th century), ff. 103-132v. *Quaestiones super De sensu et sensato*[1066].
Incipit: "Queritur primo circa librum *De sensu et sensato* utrum operationes communes anime et corpori sint subiectum in *Parvis naturalibus*. Et arguitur quod sic".
Explicit (f. 132rb): "Ad aliam dicitur |f. 132va| concedendo, et dicitur quod talis multiplicatio spiritualis vel etiam materialis potest agere in ipsum cerebrum per aliquem modum predictorum, ymmo quilibet modus per se potest sufficere; et sic est finis istius questionis et omnium aliarum libri *De sensu et sensato*. Deus sit benedictus in secula <secu>lorum. Amen."
Colophon (f. 132va): "Explete sunt questiones libri *De sensu et sensato* Deo gratias per reverendum magistrum de Parma. Scripte per me ipsum et cetera. Et incipiunt questiones libri *De memoria* (*Parvorum librorum naturalium del. et* libri *De memoria add. alia manus*)".

83. Sankt Gallen, Kantonsbibliothek (Vadiana), 839 (1471-1472), ff. 297v-311r, *Quaestiones super librum De sensu et sensato*.
Incipit: "Incipit tractatus *De sensu et sensato*. Et movetur primo haec quaestio: Utrum corpus animatum aliquo modo sit subiectum huius libri? Arguitur quod non, quia omnes passiones corporis".
Q. 2: "Utrum omnes sensus exteriores sint necessarii cuilibet animali".
Last *quaestio*: "Utrum contingat sensitivum in eodem indivisibili temporis simul plura sentire".
Explicit: "et sic indivisibile haberet partes. Quod est impossibile. Rationes solvuntur. Sequitur *De memoria autem*."

84. Wien, Österrichische Nationalbibliothek, 5235 (14th-15th century), ff. 84r-89r. *Quaestiones Wiennenses (?) secundum Ioannem Buridanum super librum De sensu et sensato Aristotelis*.
Incipit: "<C>irca librum *De sensu et sensato*, qui est primus in ordine *Parvorum naturalium*, primo queritur, utrum preter determinacionem libri *De anima* et libri *De animalibus ac plantis* oporteat ponere aliam determinacionem de operacionibus et passionibus animatorum. Pro quo nota primo".
Explicit: "una simplici sensacione etc. et secundum hoc solvatur argumentum de oppositis etc. Et sic est finis super *De sensu et sensato* etc."

85. Wien, Österreichische Nationalbibliothek 5241 (Univ. 330) (before 1426), ff. 58r-83r. *Quaestiones super librum De sensu et sensato Aristotelis*.
Incipit: "Circa librum *De sensu et sensato*, qui est primus liber in ordine *Parvorum naturalium*, queritur primo, utrum preter <de>terminacionem <libri> *De anima* et librorum *De animalibus et plantis* oporteat ese (*sic!*) aliam determinacionem de

[1066] For a first description of the content of this commentary, together with a comparison with *recensio* I of Buridan's *Quaestiones*, see the appendix of R. ZAMBIASI, "I commenti latini al *De sensu et sensato* di Aristotele (XIII-XV sec.): *status quaestionis* e prospettive per un inventario", *Aristotelica* I, 2022, pp. 101-142.

op[p]eracionibus et passionibus et proprietatibus animalium, et arguitur quod non".
Explicit: "et perducunt diversas sensaciones, scilicet sensaciones duarum rerum vel albedo et cetera [...]. Explicit liber *De sensu et sensato*."

86. Wien, Österreichische Nationalbibliothek 5247, ff. 91r-110v. *Problemata communiter legi solita circa Parva naturalia*.

87. Windsheim, Stiftbibliothek, 103, ff. 417r-421r. *Problemata in De sensu*.

88. Wolfenbüttel, Herzog August Bibliothek, 18.9, 4° Aug. Fol. (ca. 1400-ca. 1430), ff. 240r-260r. *Quaestiones Colonienses (?) super librum De sensu et sensato Aristotelis*.
Incipit: "Queritur utrum de corpore sensitivo sive de corpore animato anima sensitiva secundum passiones consequentes coniunccionem anime et corporis sensitivi sit sciencia tamquam de subiecto. Dicitur quod sic".
Explicit: "quia una est materialis et realis, alia est spiritualis et intencionalis. Hic finiuntur disputata libri *De sensu et sensato*."

89. Wolfenbüttel, Niedersächsiches Staatsarchiv, VII B 225 (1438), ff. 32r-36v. *Puncta Erffordiensia super librum De sensu et sensato Aristotelis* (incomplete).
Incipit: "Circa *Parva naturalia* <queritur> de quibus determinetur in parvis naturalium libris. Respondetur quod in eis determinatur de passionibus animatorum".
Explicit: "sicud homo vel azinus vel consimile ||".

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Riassunto sostanziale

Introduzione

La presente tesi si è proposta di indagare un tema di filosofia naturale aristotelica latina del XIII e del XIV secolo di grande rilievo ma ancora scarsamente studiato nella letteratura secondaria (sul quale, però, Aurélien Robert ha recentemente attirato l'attenzione in un pionieristico contributo), quello dei cosiddetti *minima sensibilia*. Con tale espressione ci si riferisce all'*aporia*, sollevata da Aristotele (384 a.C.-322 a.C.) in *De sensu et sensato* 6, 445b3-446a20, relativa ai limiti di divisibilità delle qualità sensibili (ovvero i sensibili propri dei cinque sensi esterni, colori, suoni, odori, gusti e le qualità tangibili) attraverso la divisione della materia a cui esse sono associate (la discussione è peraltro parte di un più ampio quadro concettuale, in quanto essa è preceduta, nel capitolo, da quella relativa ai limiti di divisibilità delle qualità sensibili in specie all'interno di ciascuno dei loro generi). L'*aporia* si pone, in particolare, nei seguenti termini: se la materia è infinitamente divisibile in potenza, in quanto continua, cosa accade alle qualità sensibili ad essa associate all'atto della divisione della materia stessa?

Se, da un lato, nota Aristotele, si ammettesse che le qualità sensibili sono infinitamente divisibili in potenza attraverso la divisione della materia a cui sono associate, si dovrebbe ammettere che esiste nella natura un potere capace di percepirle (dato che le qualità sensibili si definiscono a partire dalla loro capacità di agire sui sensi), contrariamente alla profonda convinzione aristotelica che ogni potere in natura sia di un'intensità finita. Dall'altro lato, se si dovesse concedere che le qualità sensibili non sono infinitamente divisibili in potenza attraverso la divisione della materia a cui sono associate, si dovrebbe riconoscere che i componenti ultimi dei corpi sensibili siano entità prive di qualità sensibili. Inoltre, tali entità, in quanto prive di qualità sensibili, si troverebbero del tutto al di là di ogni possibilità di essere conosciute. Infatti, non solo esse non potranno essere conosciute dai sensi, essendo prive di qualità sensibili, ma non potranno nemmeno essere conosciute dall'intelletto, dato che l'unica possibilità epistemica di accesso al mondo naturale esterno, per l'intelletto, è costituita proprio dai sensi.

La soluzione aristotelica all'*aporia* è fondata su un'attenta distinzione prima di tutto tra la percepibilità in potenza e la percepibilità in atto e, inoltre, su un'ulteriore distinzione tra tre diverse nozioni di 'percepibilità in potenza'. Grazie a tali distinzioni concettuali, Aristotele può sostenere che ogni porzione di materia, per quanto piccola, è percepibile in potenza in quanto contribuisce alla percepibilità in atto dell'intero a cui appartiene. Purtuttavia, nel momento in cui una porzione di materia viene separata "fisicamente" dall'intero a cui appartiene, due casi possono verificarsi. Al di sopra di una certa soglia di piccolezza, tale porzione di materia diventerà percepibile in atto da sola, e, da tale punto di vista, sarà possibile affermare che essa era percepibile in potenza come parte dell'intero a cui apparteneva in un secondo senso di 'percepibile in potenza'. Al di sotto di tale soglia di piccolezza, al contrario, la porzione di materia considerata non potrà diventare percepibile in atto da sola. Tuttavia, al di sotto della stessa soglia (o, forse, anche leggermente al di sopra di essa), la porzione di materia considerata verrà immediatamente corrotta dall'azione del mezzo in cui si trova, perdendo così le proprie qualità sensibili e acquistando quelle del mezzo stesso. Secondo l'importante esempio menzionato da Aristotele a questo proposito, una goccia di un liquido saporoso (vino, per esempio) versata nel mare perderà immediatamente le proprie qualità sensibili (in particolare, il proprio sapore, ma anche il proprio colore, ecc.,...) acquistando quelle del mare. A questo punto, però, Aristotele complica ulteriormente il quadro appena riassunto, in un passaggio piuttosto oscuro ma di fondamentale importanza per le successive vicende della tradizione di commento. In tale passaggio (almeno per come esso è stato letto dai commentatori), Aristotele nota che, in assenza dell'azione corruttrice esercitata dal mezzo, porzioni di materia anche estremamente piccole (e ben al di sotto della soglia di corruttibilità appena menzionata) rimarrebbero percepibili in potenza (secondo un terzo e distinto significato dell'espressione), nella misura in cui potrebbero diventare percepibili in atto unendosi a una sufficiente quantità di materia dotata delle stesse qualità sensibili.

Lo scopo della presente tesi è stato quello di analizzare il modo in cui i commentatori latini medievali del *De sensu et sensato* attivi all'incirca tra il 1250 e il 1350 hanno discusso il problema dei *minima sensibilia*, senza trascurare di leggerne le relative interpretazioni alla luce della tradizione di commento tardoantica e islamica. A tal fine, si sono tenuti in considerazione tutti i commenti latini al *De sensu* databili con sicurezza entro tale arco cronologico. La tesi si caratterizza dunque come un attento

esercizio di esegesi testuale condotto su un aspetto estremamente puntuale (e pressoché mai indagato prima) della tradizione di commento aristotelica latina del periodo compreso tra la metà del XIII secolo e la metà del XIV. L'intuizione che ha guidato tale ricerca è di ordine sia teorico che metodologico.

Dal punto di vista teorico, l'intuizione su cui si è fondata la tesi è quella secondo la quale le interpretazioni date alla soluzione aristotelica del problema dei *minima sensibilia* da parte dei commentatori latini medievali costituiscano un punto di accesso privilegiato per studiare la concezione delle qualità sensibili adottata da tali commentatori, sia dal punto di vista della loro costituzione ontologica in quanto forme accidentali delle sostanze materiali, sia da quello delle condizioni necessarie alla loro azione sui sensi esterni, e dunque alla loro percepibilità dal punto di vista epistemologico.

Dal punto di vista metodologico, l'intuizione su cui si è fondata la tesi è quella secondo la quale un'analisi complessiva di tutti i commenti a uno specifico passo di un trattato aristotelico prodotti nell'arco temporale sopra menzionato e tuttora conservatisi rappresenti un metodo di indagine particolarmente proficuo per studiare tematiche specifiche della filosofia della natura aristotelica nel Medioevo latino. In particolare, tale metodo ha il grande vantaggio di non fornire una centralità aprioristica alle posizioni di alcuni commentatori considerati come principali, e di puntare invece a ricostruire un quadro d'insieme il più dettagliato possibile in cui a ogni commentatore, noto o anonimo, viene riconosciuta in linea di principio la stessa importanza. Ciò è a maggior ragione cruciale nel caso dei commenti al *De sensu*, i quali sono rimasti nell'oblio fino a tempi molto recenti (al punto che, su più di trenta sicuramente databili al periodo oggetto di studio della tesi, solo cinque sono stati a oggi editi criticamente in forma completa, e solo altri due sono stati editi a stampa in edizioni della prima età moderna).

Capitolo 1 – La continuità delle grandezze e la loro divisibilità infinita in potenza in Aristotele e nei suoi commentatori tardoantichi e medievali

Al fine di poter ricostruire correttamente il dibattito latino medievale sui *minima sensibilia* per il periodo ca. 1250-ca. 1350, tuttavia, è stato in primo luogo necessario indagarne i presupposti.

Primo tra di essi è quello della divisibilità infinita in potenza della materia (considerata come grandezza estesa) delle sostanze materiali a cui le qualità sensibili sono associate nella prospettiva aristotelica. La divisibilità infinita in potenza delle grandezze è, in Aristotele così come nei suoi commentatori, strettamente connessa alla proprietà della continuità, al punto da apparirne un correlato inevitabile e, in alcuni casi, perfino il tratto distintivo. Certamente gli studi sulla dottrina aristotelica della continuità delle grandezze e sulla loro divisibilità infinita in potenza non mancano, così come anche sulle interpretazioni di tale dottrina da parte dei commentatori tardoantichi e (sebbene in misura minore) medievali. Tuttavia, guardando a tali studi, diventa immediatamente chiaro che i punti discordanti e controversi abbondano, e non soltanto riguardo a dettagli minori, ma anche riguardo agli aspetti centrali della dottrina aristotelica della continuità delle grandezze e della loro divisibilità infinita in potenza e delle sue interpretazioni tardoantiche e medievali. Per non menzionarne che alcuni (d'altronde di fondamentale importanza per il dibattito latino medievale sui *minima sensibilia*): la divisibilità infinita in potenza rappresenta la definizione della continuità? Qual è la differenza tra la continuità e la divisibilità infinita in potenza delle grandezze geometriche e di quelle "fisiche" (ovverosia le sostanze materiali)? Vi è un limite concettuale alla divisibilità infinita in potenza delle grandezze? Più in generale, come bisogna comprendere la nozione di potenza associata alla divisibilità infinita in potenza delle grandezze, ovvero una nozione di potenza che non può mai essere tradotta in atto?

Il primo capitolo della tesi si è proposto dunque di riesaminare queste e altre domande tramite un'analisi diretta e puntuale di alcuni dei principali passi aristotelici che presentano la dottrina della continuità delle grandezze e della loro divisibilità infinita in potenza (*Categorie* 6, *Metafisica* Δ.6, Δ.13 e I.1, *Fisica* V.3 e VI.1-2, nonché *De generatione et corruptione* I.2 e I.8), nonché delle interpretazioni di tali passi fornite dai commentatori tardoantichi, da Averroè (1126-1198) e da alcuni commentatori latini del

XIII e del XIV secolo (Alberto Magno, Tommaso d'Aquino, Giovanni Duns Scoto e Giovanni Buridano) scelti a campione sia per l'importanza intrinseca della loro analisi dei passi aristotelici oggetto di indagine sia per la loro collocazione cronologica all'interno dell'arco temporale coperto dalla presente tesi.

L'analisi condotta nel capitolo ha permesso di mettere in luce alcuni aspetti di grande importanza sia per gli studi sulla continuità delle grandezze e sulla loro divisibilità infinita in potenza nella tradizione aristotelica, sia per la ricostruzione del dibattito latino medievale sui *minima sensibilia*.

Evidentemente, tutti i commentatori analizzati, seguendo Aristotele, non hanno mai messo in discussione il fatto che le grandezze, sia "fisiche" (le sostanze materiali), sia geometriche, siano continue e infinitamente divisibili in potenza. Tuttavia, uno cambiamento importante nella concezione del rapporto reciproco tra le due proprietà si è chiaramente prodotto nel passaggio dai testi aristotelici alle interpretazioni di essi forniti dai commentatori tardoantichi prima e da quelli medievali poi.

Per comprendere tale cambiamento, è necessario prima di tutto ricordare che in Aristotele la proprietà della continuità delle grandezze è analizzata secondo due prospettive complementari ma chiaramente distinte.

La prima, prevalente sia nel sesto capitolo delle *Categorie* che in *Fisica* V.3 e nella *Metafisica*, consiste nell'analizzare la continuità nei termini della proprietà che fonda l'unità (almeno il primo e più basso grado di unità *per se*, secondo la prospettiva di *Metafisica* Δ.6) di una grandezza. In altre parole, la proprietà della continuità, secondo tale prospettiva, garantisce che una grandezza sia mereologicamente semplice nel senso di non possedere parti distinte in atto le une dalle altre. Più in particolare, ogni coppia di parti di una grandezza continua che siano contigue (ovvero, secondo la definizione fornita da Aristotele in *Fisica* V.3, parti che siano poste in successione e i cui estremi si tocchino) è anche continua (ovvero, sempre secondo la definizione fornita in *Fisica* V.3, è una coppia di parti i cui estremi sono uno). Le parti di un'entità continua possono tornare a esistere in atto solo tramite una divisione dell'entità stessa. Tuttavia, non è la divisibilità infinita in potenza a essere centrale in questa prima prospettiva di analisi della continuità adottata da Aristotele, bensì ciò che Aristotele, come accennato, riconosce esplicitamente come la definizione della proprietà della continuità in *Fisica* V.3, ovvero la concezione

della continuità come il prodotto dell'unione degli estremi di due entità e, di conseguenza, come ciò che caratterizza ogni entità le cui parti abbiano gli estremi uniti tra loro.

La seconda prospettiva di analisi della continuità in Aristotele è, invece, quella prevalente in *Fisica* VI.1-2 e in *De generatione* I.2 e I.8. In tali testi, Aristotele si confronta, direttamente o indirettamente, con la posizione degli atomisti (Democrito e Leucippo in particolare). Tale posizione è da Aristotele stesso dichiarata, in più casi, come degna di grande stima per il suo potere esplicativo e per l'economia dei principi da essa adottati e, per gli stessi motivi, come la principale rivale della sua stessa spiegazione della composizione del mondo naturale e dei processi che lo caratterizzano. Dato che la concezione del mondo naturale proposta dagli atomisti si fonda proprio sull'idea di atomi fisicamente (non concettualmente, però) indivisibili posti nel vuoto, è evidente che, per confutarla, Aristotele attribuisca un'importanza centrale, sia in *Fisica* VI.1-2 che in *De generatione* I.2 e I.8, alla nozione di divisibilità infinita in potenza. In *Fisica* VI.1-2 Aristotele, partendo dalla definizione di continuità fornita in *Fisica* V.3, afferma chiaramente che tutto ciò che è continuo (le grandezze, ma anche, derivativamente, il moto e il tempo) è infinitamente divisibile in potenza (nella misura in cui gli estremi la cui unione ha generato un'entità continua possono sempre essere nuovamente divisi), e prosegue poi a presentare alcuni importanti argomenti (sia di natura geometrica che "fisica") contro l'idea dell'esistenza di componenti ultimi indivisibili del mondo naturale. Altri argomenti sono poi introdotti in *De generatione* I.8. Particolarmente rilevante per la presente tesi è però il testo di *De generatione* I.2, dove Aristotele affronta una delle obiezioni principali alla nozione di divisibilità infinita in potenza. L'obiezione si pone nella forma di un dilemma: se un'entità infinitamente divisibile in potenza viene effettivamente divisa fino ai suoi ultimi componenti, cosa rimarrà? Se qualcosa dovesse sfuggire al processo di divisione, ciò verrebbe a costituire un componente "indivisibile" di tale entità. Se però non dovesse rimanere nulla, non vi sarebbero componenti ultimi delle entità continue (o al limite tali componenti sarebbero enti privi di estensione, ovvero dei punti), il che costituirebbe un evidente paradosso. La soluzione aristotelica al dilemma consiste nel sottolineare che la nozione di potenza propria della divisibilità infinita in potenza delle entità continue è una peculiare nozione di potenza che non può essere mai tradotta in atto, non solo fisicamente, ma neppure concettualmente.

Per illustrare tale concetto, Aristotele ricorre all'esempio geometrico della divisione di una linea in tutti i suoi punti. Significativamente, per Aristotele un punto, in quanto privo di estensione, non può essere una parte di una grandezza, come la linea. Al contrario, il punto può costituire solamente il limite di una tale grandezza, dalla quale esso dipende ontologicamente. In altre parole, le parti di una linea sono linee (segmenti) limitate da due punti ciascuna, corrispondenti ai punti nei quali la linea iniziale viene divisa. A partire da tale concezione, Aristotele afferma che una linea è sì divisibile in ogni suo punto, ma non in tutti i suoi punti. Ciò che Aristotele vuole dire è che, dal momento che un punto non può mai esistere da solo, ma esclusivamente come limite di una linea (di un segmento), è impossibile che una linea venga divisa in due punti l'uno "immediatamente prossimo" all'altro. Tra due punti distinti attualizzati dalla divisione di una stessa linea dovrà, in altre parole, sempre esistere un'altra linea, e così il processo di divisibilità infinita in potenza di tale linea non potrà mai essere pienamente attualizzato, neppure concettualmente. È in tal senso che la nozione di divisibilità infinita in potenza adottata da Aristotele è in grado di sfuggire al dilemma affrontato in *De generatione* I.2, ed è al contempo in grado di acquisire una centralità assoluta nella seconda prospettiva aristotelica di analisi della continuità.

Le due prospettive aristoteliche di analisi della continuità, tuttavia, assunsero fin dall'inizio un diverso peso presso i commentatori. Già nella tarda antichità, infatti, come si evince soprattutto dai commenti alle *Categorie*, la prima prospettiva venne progressivamente eclissata dalla seconda, e la nozione di continuità venne analizzata pressoché invariabilmente nei termini della divisibilità infinita in potenza. Ciò fu certamente dovuto, in una certa misura, anche alla necessità, per tali commentatori, di confutare una posizione atomista che, direttamente o indirettamente, si voleva invulnerabile alle critiche aristoteliche, ovvero quella di Epicuro (341 a.C.-270 a.C.). Compito importante dei commentatori tardoantichi di Aristotele fu dunque quello, tra l'altro, di mostrare se e in quale modo gli argomenti di Aristotele (o altri argomenti sviluppati *ex novo* a sostegno della posizione aristotelica) potevano essere fatti valere contro un atomismo che identificava i componenti ultimi della realtà non con degli atomi solo "fisicamente" indivisibili, ma con dei minimi indivisibili anche dal punto di vista concettuale. Tale processo, se possibile, si accentuò ancor più nel Medioevo, sia nel mondo islamico (dove ben presto sorse un'altra forma di atomismo, quella teologica del

Kalām, significativamente simile a quella epicurea) che in quello latino. Tra i commentatori latini, in particolare, sia Alberto Magno (ca. 1200-1280) che Tommaso d'Aquino (ca. 1225-1274) si spinsero fino all'estremo di sostenere che la divisibilità infinita in potenza rappresenti un'*alia definitio* della continuità, in parallelo con (non, tuttavia, al posto di) quella fornita in *Fisica* V.3.

La sottolineatura del rapporto tra continuità e divisibilità infinita in potenza, presso i commentatori latini, appare legata, almeno in parte, all'influenza di un altro filone dottrinale, ovvero quello della tradizione geometrica rappresentata dagli *Elementi* di Euclide, di cui proprio Alberto fu, tra l'altro, commentatore. Tale tradizione incoraggiò in misura significativa lo sviluppo di ulteriori argomenti geometrici contro le posizioni "indivisibiliste", argomenti diversi da quelli presentati in forma embrionale da Aristotele, ma soprattutto da quelli presentati in misura ben più cospicua dai commentatori tardoantichi e in particolare da rappresentanti della tradizione islamica come Avicenna (ca. 970-1037), al-Ghazali (ca. 1056-1111) e Averroè. Il tentativo di una completa analisi geometrica della continuità delle grandezze (e, derivativamente, del moto e del tempo) e della loro divisibilità infinita in potenza raggiunse uno dei suoi vertici nel secondo libro dell'*Ordinatio* di Giovanni Duns Scoto (1265/1266-1308), nell'ambito di una discussione sul tema del moto angelico. Tuttavia, è importante ricordare che, nonostante l'importanza acquisita dall'analisi geometrica della continuità delle grandezze (nonché del moto e del tempo) presso i commentatori latini, nessuno di essi perse mai di vista il fatto che tale analisi non riguardava, in ultimo grado, entità puramente concettuali, bensì le stesse sostanze materiali (o il moto e il tempo) a partire dalle quali le entità geometriche stesse sono, aristotelicamente, astratte.

Il processo che portò, nel passaggio da Aristotele ai suoi commentatori tardoantichi e poi a quelli medievali, all'adozione di una prospettiva in cui la divisibilità infinita in potenza acquisiva un ruolo assolutamente centrale nell'analisi della continuità è reso ancor più evidente dal fatto che, progressivamente, i commentatori si avvalsero di strumenti nuovi e più variegati per l'analisi concettuale della proprietà stessa di divisibilità infinita in potenza. Come già ricordato, infatti, in Aristotele l'idea secondo la quale la divisione all'infinito delle entità continue non può mai essere portata a termine (nemmeno, per assurdo, immaginando di avere a disposizione un tempo infinito), si fonda sull'impossibilità "topologica" di dividere un'entità continua in due punti

"immediatamente prossimi" l'uno all'altro. Nonostante questa idea sia chiaramente rimasta presente sia presso i commentatori tardoantichi che presso quelli medievali, ad essa si venne progressivamente ad aggiungere, in particolar modo presso i commentatori medievali latini, una concezione fondata sull'idea di un'impossibilità logica di dividere un'entità continua in due punti "immediatamente prossimi" l'uno all'altro. Più in particolare, i commentatori latini, già a partire da Alberto Magno, ma in misura più massiccia con Giovanni Duns Scoto e poi con Giovanni Buridano (ca. 1300-ca. 1361), utilizzarono gli strumenti della logica modale per mostrare che la proposizione universale secondo la quale un'entità continua può essere divisa in tutti i suoi punti implica un'impossibilità logica. Nella prospettiva di Alberto e, sebbene in misura ben più raffinata, di Scoto, tale impossibilità è legata a un'incompossibilità derivante dalla congiunzione delle proposizioni singolari relative alla possibilità di dividere un'entità continua in ciascuno dei suoi punti. Nella prospettiva di Buridano, tale impossibilità è invece legata alla traduzione della proposizione universale di possibilità secondo la quale un'entità continua può essere divisa in tutti i suoi punti nella corrispondente proposizione universale assertiva secondo la quale un'entità continua è (è stata) divisa in tutti i suoi punti.

Riassumendo, al di là di tutte queste distinzioni concettuali l'analisi condotta nel primo capitolo della tesi mostra chiaramente che la credenza nella continuità delle grandezze (e soprattutto quella nella loro divisibilità infinita in potenza) è profondamente radicata non solo nella filosofia naturale di Aristotele ma anche in quella dei suoi commentatori, sia tardoantichi che medievali. Prendendo in prestito la terminologia adottata da Imre Lakatos nella sua analisi dei processi di ricerca scientifici, si potrebbe affermare che la credenza nella continuità delle grandezze (e soprattutto quella nella loro divisibilità infinita in potenza) è parte del nucleo, e non solamente della cintura protettiva, della filosofia della natura di Aristotele e di quella dei suoi commentatori tardoantichi e medievali. Il riconoscimento della centralità che la credenza, in particolare, nella divisibilità infinita in potenza delle grandezze (così come del moto e del tempo) svolse in tutta la tradizione aristotelica sia tardoantica che medievale ha consentito, tra l'altro, anche di sottolineare il fatto che il dibattito sui *minima sensibilia*, contrariamente a quanto si potrebbe di primo acchito pensare, non può a nessun titolo essere considerato un episodio nella storia dell'atomismo o anche meramente del corpuscolarismo, sebbene,

come è evidente, i punti di contatto non manchino (semmai, come si è suggerito nella tesi, il dibattito sui *minima sensibilia* può essere più proficuamente analizzato nel quadro concettuale del problema della "persistenza" delle forme, in questo caso accidentali, attraverso la divisione della materia a cui esse sono associate).

Al contrario, è proprio in virtù del fatto che la credenza nella divisibilità infinita in potenza delle grandezze sia sempre rimasta così radicata nella tradizione aristotelica tardoantica e medievale che il dibattito sui *minima sensibilia* acquisì in essa un'urgenza particolare.

Capitolo 2 – Il dibattito latino medievale sui *minima naturalia*: una rivalutazione

Prima di poter affrontare direttamente lo sviluppo del dibattito sui *minima sensibilia*, la presente tesi ha dovuto affrontare un ulteriore aspetto. Le qualità sensibili, infatti, non sono concepite, nella visione del mondo aristotelica, come entità dotate di un'autonomia ontologica. Per esistere, in altre parole, le qualità sensibili, meglio, le loro forme accidentali, devono inerire in una sostanza materiale composta di materia e di una forma sostanziale. La soluzione, dunque, del problema limiti alla divisibilità delle forme accidentali delle qualità sensibili attraverso la divisione della materia a cui esse sono associate richiede, preliminarmente, la soluzione del problema dei limiti alla divisibilità delle forme sostanziali che informano tale materia stessa, il cosiddetto problema dei *minima naturalia*. Se, infatti, si dovesse riconoscere che esiste un limite alla divisibilità delle forme sostanziali attraverso la divisione della materia da esse informate, bisognerebbe anche riconoscere che tale limite valga anche per la divisibilità delle forme accidentali delle qualità sensibili, salvo negare il fondamentale principio aristotelico per cui un accidente non può mai esistere senza il proprio *subiectum*. Certamente, il testo di *De sensu* 6, 445b3-446a20 non fa riferimento alle forme sostanziali, tuttavia la coscienza dello strettissimo legame tra i due aspetti emerse molto presto nella tradizione di commento, e costituì un aspetto significativo del dibattito latino medievale sui *minima sensibilia*.

Il secondo capitolo della tesi si è dunque proposto di ricostruire il dibattito sui *minima naturalia* a partire dai principali passi aristotelici a cui esso venne legato dai commentatori (in particolare *Fisica* I.4), seguendone tutte le fasi di sviluppo attraverso la tradizione di commento tardoantica e poi quella medievale. Tra i commentatori medievali, nell'ambito islamico si è (nuovamente) riconosciuto un ruolo preponderante ad Averroè, considerando il fatto che l'influenza del dibattito islamico sul Medioevo latino passò, riguardo al tema dei *minima naturalia*, esclusivamente attraverso i suoi commenti. Quanto al Medioevo latino, si è cercato di dare priorità, prima di tutto, ai commentatori compresi tra il 1250 circa e il 1350 circa i quali si siano anche confrontati col tema dei *minima sensibilia*, in modo da consentire al lettore di formarsi un quadro completo delle rispettive posizioni dei commentatori stessi riguardo ai *minima naturalia* e ai *minima sensibilia*. Al contempo, però, si è anche cercato di focalizzare l'attenzione

su alcuni commentatori che, sebbene non presentino una posizione specifica sul tema dei *minima sensibilia*, abbiano avuto un'importanza centrale per il dibattito latino medievale sul tema dei *minima naturalia*, influenzando così (almeno indirettamente) anche il dibattito latino sui *minima sensibilia*. Si noti peraltro che, a differenza di quanto già ricordato per il dibattito latino medievale sui *minima sensibilia*, il corrispondente dibattito sui *minima naturalia* è già stato oggetto di importanti sondaggi dottrinali nella letteratura secondaria, a partire dai pionieristici studi di Pierre Duhem e poi soprattutto grazie alle attente analisi di Anneliese Maier e di John Murdoch. Tuttavia, la recente pubblicazione di un cospicuo numero di edizioni critiche di commenti latini medievali (specialmente alla *Fisica*) in cui il tema dei *minima naturalia* è esplicitamente affrontato, nonché la maggiore disponibilità di informazioni in merito alla tradizione manoscritta dei commenti tuttora inediti, legittima, così almeno si è ritenuto, un aggiornamento dei risultati raggiunti finora nella letteratura secondaria, non, evidentemente, con lo scopo di soppiantarli e di metterli radicalmente in discussione, ma, semmai, di approfondirli, completarli, e talvolta correggerli alla luce di un più capillare e sviluppato quadro concettuale d'insieme.

Il punto di partenza del capitolo è stata, come detto, l'analisi dei passi aristotelici da cui il dibattito dei commentatori riguardo ai *minima naturalia* ha preso le mosse. Come è stato ampiamente riconosciuto, Aristotele non possiede una dottrina dei *minima naturalia* dotata di una riconoscibile fisionomia, a differenza di quanto accade, invece, nel caso dei *minima sensibilia*. Tuttavia, come già accennato, vi è almeno un passo che, nella tradizione di commento, è stato associato in modo particolare al tema dei *minima naturalia*, ovvero il quarto capitolo del I Libro della *Fisica*. In tale capitolo Aristotele, nell'ambito di una complessiva dossografia delle posizioni dei suoi predecessori in merito ai principi della natura, si confronta direttamente con la posizione di Anassagora, e in particolare con la sua duplice tesi secondo la quale tutto è presente in tutto e tutto viene generato da tutto. Tra gli argomenti con i quali Aristotele si oppone alla duplice tesi anassagorea figura quello secondo il quale non è possibile che tutto sia presente in tutto, e che tutto venga generato da tutto, perché vi sono dei limiti alle dimensioni degli esseri viventi e così, necessariamente, anche a quelle dei loro componenti omogenei, per cui, oltre tali limiti, non sarà più vero che tutto sia presente in tutto e che tutto venga generato da tutto. L'argomento, si noti bene, distingue già tra gli esseri viventi, intesi come sostanze eterogenee, e i loro componenti omogenei, permettendo così di porre una distinzione che

sarebbe stata centrale nel successivo dibattito sui *minima naturalia*. Nessuno dei commentatori analizzati nella tesi, infatti, mise mai in discussione l'esistenza di una soglia di piccolezza oltre la quale una sostanza eterogenea (un essere vivente) poteva mantenere la sua natura; il caso veramente controverso, quello su cui si concentrò il dibattito specialmente latino sui *minima naturalia*, riguarda invece proprio le sostanze omogenee (su tale caso la tesi si è dunque concentrata nella ricostruzione del dibattito sui *minima naturalia* e, per coerenza concettuale, anche nella ricostruzione del dibattito sui *minima sensibilia*). Ciononostante, è importante notare che se l'argomento aristotelico anticipa un'importante distinzione propria del dibattito successivo, in esso manca però quello che ne avrebbe costituito l'elemento centrale. L'argomento aristotelico (così come più in generale tutta la discussione condotta in *Fisica* I.4), infatti, non è formulato in termini ilemorfici, e ciò per la semplice ragione che la forma, in quanto principio della natura, sarà introdotta da Aristotele solo in *Fisica* I.7.

Fu solamente a partire dai commentatori tardoantichi, e, tra essi, in particolare a partire da Giovanni Filopono (ca. 490 d.C.-ca. 570 d.C.), che l'argomento aristotelico di *Fisica* I.4 verrà riformulato in termini esplicitamente ilemorfici. Nell'analisi di Filopono, l'argomento di Aristotele, concepito esplicitamente nei termini di un vero e proprio "assioma", consiste nell'affermare che ogni corpo naturale può essere concepito in due modi: da un lato come mera grandezza continua, dall'altro lato come composto ilemorfico di materia e forma. Dal primo punto di vista, non vi sono evidentemente limiti alla divisione del corpo considerato, proprio perché la sua natura continua ne implica la divisibilità infinita in potenza. Dal secondo punto di vista, tuttavia, il corpo considerato incontra un limite ben preciso alla propria divisibilità. Se, infatti, la sua materia è infinitamente divisibile in potenza in quanto continua, la sua forma non lo è. Più precisamente, nota Filopono, al di sotto di una certa soglia di piccolezza (come, peraltro, al di sopra di una certa soglia di grandezza) la forma di un corpo si "attenua" fino a perdersi del tutto (Filopono ricorre a questo proposito a un verbo che rappresenta pressoché un neologismo nel lessico filosofico greco, un aspetto che segnala così a maggior ragione la novità teorica del concetto a cui esso è associato).

La trattazione di Filopono pose così in termini molto chiari il problema dei *minima naturalia* in un quadro concettuale compiutamente ilemorfico. È a partire da tale punto di svolta che il dibattito medievale sui *minima naturalia* poté chiaramente articolarsi

secondo una fisionomia riconoscibile. Per poter però ricostruire adeguatamente tale dibattito, si è ritenuto indispensabile, nel capitolo, fornire in via preliminare una vera e propria tipologia (una griglia interpretativa) delle posizioni adottate dai commentatori medievali, consentendone così una più facile lettura e una più immediata possibilità di messa a confronto.

In estrema sintesi, si è sottolineato che le posizioni medievali sul problema dei *minima naturalia* si suddividono in due grandi gruppi, quello delle dottrine "intrinseche" dei *minima naturalia* e quello delle dottrine "estrinseche".

Col termine di dottrine "intrinseche" dei *minima naturalia* ci si riferisce a tutte quelle dottrine che considerano l'esistenza di *minima naturalia* nelle sostanze materiali (in particolare, come si è detto, l'attenzione si è concentrata sul caso delle sostanze omogenee) come dipendente da fattori interni a tali sostanze stesse. In altre parole, secondo tali dottrine, anche considerando una sostanza materiale (omogenea) isolandola dall'ambiente in cui si trova, e anche da ogni possibile relazione con altre sostanze, è possibile identificare in essa una soglia di piccolezza al di sotto della quale la sua struttura metafisica subisce delle modifiche significative. La dottrina "intrinseca" dei *minima naturalia* più radicale è certamente quella secondo la quale la forma sostanziale di ogni sostanza materiale determina la (massima e) la minima quantità di materia che essa può informare, e in cui dunque essa può esistere. Secondo tale dottrina, al di sotto di tale minima quantità di materia la forma sostanziale della sostanza materiale considerata viene immediatamente corrotta. L'espressione che è stata adottata nella tesi per descrivere questa prima dottrina "intrinseca" dei *minima naturalia* (una formulazione originale coniata in analogia con le espressioni utilizzate nella letteratura secondaria per indicare le altre dottrine dei *minima naturalia*) è quella di dottrina *dei minima secundum formam*. Una differente dottrina "intrinseca" dei *minima naturalia* è quella, meno radicale, secondo la quale, nonostante non vi sia una minima quantità di materia al di sotto della quale la forma sostanziale di una data sostanza materiale non può esistere, vi è però una minima quantità di materia al di sotto della quale la forma sostanziale della sostanza considerata perde il potere di svolgere l'operazione (o un'operazione) a essa propria. L'espressione adottata nella tesi per riferirsi a tale seconda dottrina "intrinseca" dei *minima naturalia* (seguendo l'uso invalso nella letteratura secondaria) è quello di dottrina dei *minima secundum operationem*. Una terza dottrina "intrinseca" dei *minima naturalia*,

apparentemente molto simile alla precedente ma di fatto chiaramente distinta da essa, è quella secondo la quale al di sotto di una certa soglia di piccolezza la forma sostanziale di una sostanza materiale (omogenea), sebbene possieda ancora il potere di svolgere l'operazione (ogni operazione) a essa propria, non sia tuttavia in grado di raggiungere l'effetto a essa conseguente. Nella tesi ci si è riferiti a tale dottrina usando l'espressione (adottata dai commentatori stessi che presentano questa posizione) di dottrina dei *minima secundum actionem*. Infine, un caso limite tra le dottrine "intrinseche" e quelle "estrinseche" dei *minima naturalia* è quello costituito dalla dottrina secondo la quale, al di sotto di una certa soglia di piccolezza, i sensi esterni non sono in grado di percepire la sostanza stessa, e dunque la sua forma sostanziale. Tuttavia, tale dottrina precisa che questa impossibilità non dipende da un limite *a parte immutantis*, dunque da un limite riconducibile alla forma sostanziale della sostanza stessa, la quale, tramite le forme accidentali delle proprie qualità sensibili, agisce verso i sensi esterni anche in porzioni di materia troppo piccole per essere percepibili. Il limite da cui dipende l'"impercepibilità" di tali porzioni di sostanza dipende invece da un limite *a parte immutatis*, ovvero da un limite dei poteri sensoriali stessi, i quali non sono in grado di ricevere le sensazioni prodotte dall'azione di qualità sensibili (e, indirettamente, delle rispettive forme sostanziali) di porzioni estremamente piccole di materia. Questa dottrina, che, come si vede chiaramente, è principalmente una dottrina dei *minima sensibilia*, e solo derivativamente una dottrina dei *minima naturalia*, è la dottrina alla quale nella tesi ci si è riferiti (seguendo l'uso invalso nella letteratura secondaria) con l'espressione di dottrina dei *minima secundum sensum*.

Oltre alle dottrine "intrinseche" dei *minima naturalia*, come detto, l'altra categoria fondamentale delle dottrine medievali dei *minima naturalia* è costituita da quelle "estrinseche". Con tale termine ci si vuole riferire alle dottrine che considerano l'esistenza di *minima naturalia* nelle sostanze materiali (omogenee) come interamente dipendente da fattori esterni a esse. Più in particolare, i commentatori che adottano tali dottrine ritengono che non sia possibile identificare una soglia di piccolezza al di sotto della quale la struttura metafisica di una sostanza subisca un cambiamento significativo se si considera la sostanza stessa in modo isolato, indipendentemente dall'ambiente in cui si trova e, più in generale, dalle sue relazioni con altre sostanze. Al contrario, una volta che la sostanza in oggetto sia considerata come parte di un ambiente ben determinato, e una

volta che sia dunque riconosciuta l'esistenza di un'azione corruttrice esercitata dal mezzo in cui la sostanza si trova sulla sostanza stessa (un aspetto che, come visto, sebbene assente nel testo di *Fisica* I.4, occupa invece un posto importante in quello di *De sensu* 6), diventa possibile individuare una soglia di piccolezza al di sotto della quale la forma sostanziale della sostanza considerata diventa incapace di resistere (tramite le forme accidentali delle proprie qualità primarie) all'azione corruttrice del mezzo. Al di sotto di tale soglia di piccolezza, dunque, secondo i sostenitori delle dottrine "estrinseche" dei *minima naturalia*, la forma sostanziale di una sostanza materiale (omogenea) è immediatamente corrotta dal mezzo in cui si trova e la materia della sostanza stessa acquista conseguentemente la forma sostanziale del mezzo. Sebbene tutti i commentatori medievali analizzati nella tesi che adottano una dottrina "estrinseca" dei *minima naturalia* accettino questa caratterizzazione della dottrina stessa, importanti differenze emergono nel modo in cui il processo di corruzione oggetto di analisi è concepito. Questo giustifica, dunque, l'uso del plurale per riferirsi a un gruppo di dottrine che, in ogni caso, sono state tutte indicate, nella tesi (seguendo l'uso invalso nella letteratura secondaria), con l'espressione di dottrine dei *minima secudum corruptionem*.

Secondo la tipologia (o griglia interpretativa) appena presentata, la dottrina di Filopono potrebbe a buon diritto essere considerata un antesignano della dottrina dei *minima secundum formam*.

Nel mondo islamico tale dottrina trovò una consonanza significativa con quella di Averroè, sebbene non con quella di Avicenna. Come recentemente mostrato da Jon McGinnis, infatti, sebbene Avicenna discusse del problema dei *minima naturalia* nel terzo trattato della *Fisica* del *Kitāb al Shifā'*, la sua posizione è chiaramente incentrata sul ruolo dell'azione corruttrice esercitata dal mezzo in cui una data sostanza materiale si colloca, e può quindi a buon diritto essere ricondotta a una dottrina dei *minima secundum corruptionem*. D'altronde, il capitolo in cui Avicenna sviluppò tale discussione, ovvero il dodicesimo del terzo trattato della *Fisica* del *Kitāb al Shifā'*, costituisce uno dei capitoli che non vennero inclusi nella traduzione latina medievale del trattato (la cui circolazione fu peraltro, in ogni caso, probabilmente ridotta).

Fu dunque Averroè, tra i pensatori islamici, a esercitare un'influenza pressoché decisiva sul dibattito latino medievale riguardo ai *minima naturalia*. La sua dottrina al riguardo, come recentemente riconosciuto grazie agli importanti studi di Ruth Glasner,

non venne elaborata nel contesto del commento a *Fisica* I.4, bensì di quello del commento a *Fisica* VII.1. In particolare, nel *Commento grande* (quello tra i commenti di Averroè in cui la dottrina è formulata nel modo più esplicito) a *Fisica* VII.1 Averroè, interrogandosi sull'esistenza di una prima parte nel moto, nota che tutte le sostanze materiali (in particolare quelle omogenee; l'esempio di Averroè è quello del fuoco) possiedono una dimensione minima di materia al di sotto della quale la sua forma sostanziale non può esistere in essa. Averroè propose dunque, in termini altrettanto espliciti (se non più espliciti) di quelli di Filopono, una compiuta dottrina dei *minima secundum formam*.

Tale dottrina ebbe una vasta eco nel Medioevo latino. Essa, infatti, rappresentò una delle posizioni (sebbene non quella maggioritaria) adottate nella prima fase della recezione della filosofia naturale aristotelica a Oxford intorno alla metà del XIII secolo, come mostra il fatto che essa figuri esplicitamente in Adamo di Buckfield (ca. 1220–1279/92), e in particolare nella sua *Quaestio de augmento*. Inoltre, tale posizione acquisì un'importanza ben più significativa nel dibattito della seconda metà del XIII secolo. In tale periodo, infatti, essa venne difesa con grande vigore da Tommaso d'Aquino nel proprio commento alla *Fisica* e anche da Pietro d'Alvernia (ca. 1240/50-1304), certamente in uno dei suoi *Quodlibeta* ma anche nel commento alla *Fisica* pubblicato nel 1941 da Philippe Delhaye sotto il nome di Sigieri di Brabante (ca. 1240-ca. 1281/1284) e, con tutta probabilità, da attribuirsi (almeno per la parte relativa, tra l'altro, al I Libro della *Fisica*) allo stesso Pietro d'Alvernia. Nella formulazione data dallo Pseudo-Sigieri, in particolare, la soglia di piccolezza al di sotto della quale la forma sostanziale di una sostanza materiale non può sussistere è identificata con la soglia di piccolezza al di sotto della quale la forma sostanziale stessa non possiede più una *virtus conservans* sufficiente a garantirne l'esistenza. La dottrina dei *minima secundum formam* (che continuò peraltro a circolare anche in ambito oxoniense fino almeno alla fine del XIII secolo, come attesta il caso del commento alla *Fisica* di Tommaso Wylton (*fl*. ca. 1288-1327)), tuttavia, generò una forte opposizione, alla Facoltà delle Arti di Parigi, già nelle prime decadi della seconda metà del XIII secolo. Essa, in particolare, venne attaccata con veemenza da Boezio di Dacia (*magister artium* a Parigi negli anni '60 e '70 del XIII secolo) nel proprio commento alla *Fisica*, sulla base di due argomenti strettamente correlati tra loro.

Prima di tutto, Boezio notò come la dottrina dei *minima secundum formam* presupponeva che una sostanza (o più precisamente una porzione di essa) potesse essere

corrotta senza l'intervento di un agente causale esterno dotato di qualità primarie contrarie a quelle della sostanza stessa, contrariamente a un principio fondamentale della filosofia della natura aristotelica. Inoltre, Boezio notò anche come la dottrina dei *minima secundum formam* presupponesse anche la possibilità della corruzione di una sostanza (o più precisamente di una porzione di essa) senza la generazione di un'altra sostanza, contrariamente a un altro principio fondamentale della filosofia della natura aristotelica. Ulteriori critiche alle dottrine "intrinseche" dei *minima naturalia*, rivolte però primariamente proprio contro la dottrina dei *minima secundum formam*, vennero mosse da Giovanni Duns Scoto nel secondo libro dell'*Ordinatio*, proprio nell'ambito della già menzionata discussione in merito alla continuità e alla divisibilità infinita in potenza occasionata dal problema del moto degli angeli. La veemenza e la forza delle critiche di Boezio e di Scoto furono tali da rendere la dottrina dei *minima secundum formam* una posizione di minoranza nel dibattito sui *minima naturalia* durante il XIV secolo.

La dottrina dei *minima secundum operationem* attraversò vicende molto diverse nel Medioevo latino. Essa, infatti, dimostrò di essere molto popolare fin dalla prima fase della recezione della filosofia naturale aristotelica, tanto da essere adottata sia in un commento anonimo alla *Fisica* databile attorno alla metà del XIII secolo ed erroneamente pubblicato sotto il nome di Ruggero Bacone (1214/1220-1292), le *Quaestiones supra libros quatuor Physicorum Aristotelis*, sia nel commento al *De generatione* redatto negli stessi anni da Alberto Magno. La posizione di Alberto è, a questo proposito, peculiare (sebbene, come si vedrà più avanti, essa trovi un parallelo molto stringente con la posizione adottata da Alberto riguardo ai *minima sensibilia* nel proprio commento al *De sensu*). Alberto lega infatti strettamente la nozione aristotelica di *minimum naturale* a quella democritea di atomo (prendendo le mosse probabilmente dalla centralità della posizione democritea come obiettivo polemico aristotelico nel testo del *De generatione*, come già ricordato). Nella prospettiva di Alberto, Democrito identificava erroneamente come atomi indivisibili quelli che in realtà sono dei meri *minima naturalia secundum operationem* di una data sostanza materiale (omogenea), perfettamente divisibili in parti più piccole dotate della stessa composizione ilemorfica, ma non del potere di svolgere l'operazione a essi propria. Alberto si spinge fino al punto di riconoscere a tali *minima* un ruolo costitutivo delle sostanze materiali (omogenee) stesse (dal punto di vista, tuttavia, della mera *compositio quantitativa*, e non della più fondamentale *compositio essentialis*,

come ricordato dallo stesso Alberto). La dottrina dei *minima naturalia secundum operationem*, tuttavia, tese a scomparire a partire dalla seconda metà del XIII secolo (sebbene alcuni commentatori, soprattutto oxoniensi, vi ricorsero ancora nel pieno XIV secolo – per esempio lo stesso Guglielmo di Ockham (ca. 1287-1347) nelle sue *Quaestiones* sulla *Fisica*). Una sorte simile subì anche la dottrina dei *minima secundum actionem*, adottata con forza tra la fine degli anni '50 e l'inizio degli anni '60 del XIII secolo da Goffredo di Aspall (*ob*. 1287) nel proprio commento a *Fisica* I.4, ma ben presto divenuta più marginale.

Significativamente, le ragioni della caduta in disgrazia sia della dottrina dei *minima secundum operationem* che di quella dei *minima secundum actionem* sembrano legate, in larga misura, proprio al testo di *De sensu* 6. Ciò è particolarmente il caso per ciò che riguarda la dottrina dei *minima secundum actionem*. In effetti, Aspall in particolare, nella formulazione della dottrina dei *minima secundum actionem*, si era richiamato esplicitamente alla distinzione tra ciò che è sensibile *virtute* e ciò che è sensibile *actione* nella *translatio vetus* di *De sensu* 6. Con tale coppia di termini l'anonimo autore della traduzione intendeva evidentemente rendere la contrapposizione aristotelica tra ciò che è percepibile in potenza e ciò che lo è in atto, e ciò venne pienamente compreso dai commentatori che utilizzarono la *vetus* (da Adamo di Buckfield ad Alberto Magno). Tuttavia, l'utilizzo di questa coppia di termini stimolò la riflessione di Aspall (come quella di altri commentatori oxoniensi della stessa epoca), spingendolo a elaborare una dottrina secondo la quale la forma sostanziale di una sostanza materiale (omogenea) è sempre in grado di svolgere un'azione sull'ambiente in cui si trova, sia per assimilare a sé ciò che la circonda, sia per muoversi verso il proprio luogo naturale, ma non è sempre in grado di raggiungere l'effetto naturale di tale azione. Per usare la terminologia adottata da Aspall, la forma sostanziale di una sostanza materiale (omogenea) è sempre in grado di compiere un'*actio inclinans*, ma non (quando presente in porzioni inferiori a una data soglia di piccolezza) un'*actio inclinans et consequens effectum*.

Fu proprio il già ricordato Pseudo-Sigieri (molto probabilmente, come detto, Pietro d'Alvernia) a sottolineare, avvalendosi tra l'altro della *translatio nova* del *De sensu*, realizzata da Guglielmo di Moerbeke (ca. 1215-ca. 1286), che l'intenzione di Aristotele in *De sensu* 6, 445b3-446a20, non era certo quella di distinguere tra entità in grado di compiere una *mera actio inclinans* ed entità in grado di compiere un'*actio inclinans et*

consequens effectum, ma quella di sottolineare la differenza tra ciò che è in grado di compiere un'azione in atto e ciò che possiede solo la potenza di compierla. Peraltro, estendendo la sua critica non solo ai *minima secundum actionem*, ma anche agli stessi *minima secundum operationem*, lo Pseudo-Sigieri sottolineò che un'entità che non ha il potere di compiere l'operazione a essa propria inevitabilmente perde anche la propria essenza. Significativamente, lo Pseudo-Sigieri appoggiò questo argomento all'autorità di Averroè, in particolare a quella di un argomento analogo formulato da Averroè nel *Commento grande* a *Metafisica* Θ.3. Si tratta di un aspetto da sottolineare, perché questo argomento, insieme a un altro parallelo tratto dal *Commento grande* a *Metafisica* H, sarebbe stato al centro del dibattito sui *minima sensibilia* alla Facoltà delle Arti di Parigi tra la fine del XIII secolo e l'inizio del XIV secolo, come verrà mostrato tra breve. In ogni caso, anche al di là delle critiche mosse dallo Pseudo-Sigieri, lo stesso Boezio di Dacia criticò le dottrine dei *minima secundum operationem* e dei *minima secundum actionem* notando che una porzione di una sostanza materiale (omogenea, e in particolare elementare), per quanto piccola, non perde mai il potere di muoversi verso il proprio luogo naturale e di raggiungere tale luogo, a meno che non incontri l'opposizione esercitata da un'altra sostanza, secondo un altro fondamentale principio di filosofia naturale aristotelica. Infine, come già ricordato, lo stesso Scoto nell'*Ordinatio* rivolse le sue critiche non esclusivamente alla dottrina dei *minima secundum formam*, ma anche alle dottrine dei *minima secundum operationem* e dei *minima secundum actionem*. Fu certamente il risultato combinato di tali critiche a determinare, in larga misura, il declino non solo delle dottrine dei *minima secundum formam*, ma anche di quelle dei *minima secundum operationem* e dei *minima secundum actionem*.

Tuttavia, è bene ricordare che una riflessione sul fatto che una forma (sostanziale, ma anche accidentale) debba essere in grado di svolgere l'operazione a essa propria per poter esistere in un dato composto ilemorfico emerse con chiarezza alla Facoltà delle Arti di Parigi tra la fine del XIII secolo e l'inizio del XIV secolo. Tale riflessione, che svolgerà un ruolo molto importante nel dibattito latino medievale sui *minima sensibilia*, come si vedrà tra breve, trova riscontro sia nel commento alla *Fisica* di Rodolfo il Bretone (ca. 1270-1320/21) che in quello di Giovanni di Jandun (ca. 1285-1328). È molto difficile determinare quale sia stata l'origine di questo importante dibattito metafisico, che certamente coinvolse un ampio numero di *magistri artium* attivi a Parigi nel periodo

compreso tra (perlomeno) il 1290 circa e il 1310 circa. Ciò che è possibile affermare con sicurezza è che la posizione adottata sia da Rodolfo il Bretone sia da Jandun sembra costituire una dottrina "intrinseca" dei *minima naturalia* secondo la quale, dato che il fatto che una forma (sostanziale, in questo caso) possieda il potere di svolgere l'operazione a essa propria (nel caso della forma sostanziale di una sostanza omogenea, in particolare quella di agire sull'ambiente circostante per assimilarlo a sé) è una condizione necessaria per l'esistenza di tale forma, e dato che il possesso del potere di svolgere tale operazione richiede una certa quantità di materia, al di sotto di tale quantità, non potendo conservare il potere di svolgere l'operazione a essa propria, la forma sostanziale considerata è inevitabilmente corrotta. Evidentemente, dato che la forma sostanziale di una sostanza omogenea non può agire sull'ambiente esterno se non attraverso le forme accidentali delle sue qualità primarie, il potere a cui la dottrina si riferisce è primariamente quello delle forme accidentali delle qualità primarie, nella misura in cui esse agiscono come cause strumentali della forma sostanziale della sostanza in cui ineriscono. La dottrina "intrinseca" dei *minima naturalia* adottata da Rodolfo il Bretone e da Jandun è dunque una dottrina che è certamente più radicale della dottrina dei *minima secundum operationem* (e a fortiori di quella dei *minima secundum actionem*), la quale accetta tranquillamente che una forma possa esistere senza possedere il potere di svolgere l'operazione a essa propria. Al contempo, la dottrina adottata da Rodolfo il Bretone e da Jandun è leggermente meno radicale della dottrina dei *minima secundum formam*, dato che essa dipende primariamente da una considerazione delle condizioni di esistenza poteri delle forme, e non di quelle delle forme stesse, e, tra l'altro, tale considerazione riguarda prima di tutto le condizioni di esistenza dei poteri delle qualità primarie in quanto cause strumentali delle forme sostanziali, e non di quelli delle forme sostanziali stesse. Come già detto, il dibattito sul rapporto tra l'esistenza delle forme e il possesso del potere da parte di tali forme di svolgere l'operazione a esse propria sarà centrale anche nella discussione riguardo ai *minima sensibilia* condotta, tra l'altro, da Rodolfo il Bretone e da Giovanni di Jandun. Tuttavia, come si vedrà tra breve, in tale caso, trattando delle forme accidentali delle qualità sensibili, le conclusioni raggiunte dai due commentatori saranno parzialmente diverse da quelle da essi raggiunte riguardo alle forme sostanziali nei rispettivi commenti alla *Fisica*.

Una vicenda ancora diversa fu quella che attraversò invece nel Medioevo latino la dottrina dei *minima secundum sensum*. Tale dottrina venne adottata fin dalla metà del XIII secolo da Ruggero Bacone nel proprio commento alla *Fisica* (e, come si vedrà tra breve, anche nel proprio commento al *De sensu*), sebbene tale dottrina sembri già discernibile anche nell'anonimo commento alla *Fisica* attribuito a Riccardo Rufo di Cornovaglia (*fl*. 1231-1256). Questa dottrina, pur non esercitando una vasta eco nell'Europa continentale, rimase un'opzione legittima e costantemente presente nel dibattito oxoniense. Scoto mostrò infatti una certa simpatia per essa nell'*Ordinatio*, ed essa figura ancora nella *Summa logicae et philosophiae naturalis* di Giovanni Dumbleton (*ob*. ca. 1349) alcuni decenni più tardi. Come si vedrà peraltro a breve, questa opzione teorica caratterizzò sempre, in parallelo, il dibattito oxoniense sui *minima sensibilia* per tutto il XIII secolo e anche per i primi decenni del XIV secolo.

Se la dottrina dei *minima secundum sensum* rappresentò certamente un'alternativa attraente per i commentatori oxoniensi che non volevano adottare altre (e più radicali) dottrine "intrinseche" dei *minima naturalia*, a Parigi i commentatori che non volevano adottare dottrine "intrinseche" dei *minima naturalia* ripiegarono invece sulla dottrina "estrinseca" dei *minima secundum corruptionem*. In effetti, sia Boezio di Dacia che Giovanni Duns Scoto sostennero questa posizione, seppure sottolineando che essa poteva solamente giustificare una nozione di *minimum naturale* puramente "estrinseca" nelle sostanze materiali (omogenee). A partire dai primi decenni del XIV secolo la dottrina dei *minima naturalia secundum corruptionem* divenne così la dottrina pressoché universalmente accettata da parte dei commentatori attivi alla Facoltà delle Arti di Parigi (e non solo). Eppure, come già anticipato, la dottrina stessa subì, in questo periodo, delle profonde modifiche. In particolare, Walter Burley (ca. 1275-1344) da un lato e Giovanni Buridano, Nicola Oresme (ca. 1320-1382) e Alberto di Sassonia (ca. 1316-1390) dall'altro, sebbene muovendo da premesse teoriche differenti, si opposero alla concezione tradizionale secondo la quale i processi di corruzione delle sostanze materiali (e di porzioni di esse) avvenngono istantaneamente. In particolare, essi adottarono una concezione temporalmente estesa dei processi di corruzione (e del mutamento sostanziale *tout court*), ovvero una concezione secondo la quale il mutamento sostanziale di una sostanza materiale (quantomeno di una sostanza materiale omogenea), così come quello di una qualsiasi porzione di essa dotata di un'estensione tridimensionale, ha luogo

attraverso un intervallo di tempo dotato di un'estensione diversa da zero. Nel caso di Walter Burley, questa concezione derivava dalla teoria, adottata nel cosiddetto *Tractatus primus* e poi rimasta presente, secondo ogni evidenza, nell'ultimo commento alla *Fisica*, secondo la quale un accidente è in grado di produrre, da solo, un mutamento sostanziale, e secondo la quale, dunque, la corruzione di una sostanza (o di una sua porzione) è il limite inclusivo del suo processo di alterazione. Secondo tale concezione, sebbene la corruzione propriamente intesa (e dunque il mutamento sostanziale) rimanga istantaneo, il processo di corruzione (e dunque di mutamento sostanziale) comprensivo dell'alterazione pregressa viene a essere temporalmente esteso. Nel caso, invece, di Giovanni Buridano, Nicola Oresme e Alberto di Sassonia, la concezione temporalmente estesa del mutamento sostanziale si affermò a partire dall'idea secondo la quale tutte le forme sostanziali (tranne l'anima razionale) sono entità dotate di un'estensione quantitativa le cui parti sono co-localizzate con le parti della materia informata dalla forma stessa. A partire da tale concezione, questi commentatori derivano l'idea che il processo di corruzione di una sostanza materiale (quantomeno di una sostanza omogenea, ma, almeno per Alberto di Sassonia, anche di una sostanza eterogenea, a parte un essere umano), così come quello di ogni sua porzione dotata di un'estensione tridimensionale, sia un processo che avviene attraverso un intervallo temporale esteso, quello richiesto per corrompere prima le parti più esterne della sostanza stessa considerata (o di una sua porzione dotata di estensione tridimensionale) e successivamente quelle più interne.

Una conseguenza inevitabile della concezione temporalmente estesa del mutamento sostanziale delle sostanze materiali omogenee (così come delle loro porzioni dotate di estensione tridimensionale), sia nella versione adottata da Burley, sia in quella adottata da Buridano, Oresme e Alberto di Sassonia, è che la nozione di un *minimum naturale secundum corruptionem* perda di significato. In effetti, se la corruzione di una porzione estremamente piccola di una sostanza materiale (omogenea) avviene attraverso un intervallo temporale esteso, anche una parte infinitamente piccola di tale porzione (e dunque della sua forma sostanziale) giunge all'esistenza perlomeno per un istante di tempo, secondo la divisibilità infinita in potenza dell'intervallo di tempo esteso attraverso cui la corruzione stessa avviene. In questo senso, l'unica nozione di *minimum naturale secundum corruptionem* (e di *minimum naturale tout court*) che commentatori come Burley, Buridano, Oresme e Alberto di Sassonia possono ammettere è la nozione della

minima quantità di materia in cui la forma sostanziale di una data porzione di una sostanza materiale (omogenea) è in grado di resistere all'azione corruttrice esercitata dal mezzo in cui si trova, una quantità (definita *minimum circonstantionatum* da Burley e *minimum resistendo contra corruptionem* da Oresme) che tra l'altro, come notato da tali commentatori, dipende anche dall'intensità dell'azione del mezzo stesso.

La scomparsa di una nozione teoricamente "forte" di *minimum naturale* nel dibattito parigino sui *minima naturalia* nei decenni centrali del XIV secolo è certamente un risultato sorprendente dell'investigazione condotta nel secondo capitolo della tesi, un risultato ancora più sorprendente se si considera che, nel XVI secolo, la nozione di *minimum naturale* venne invece utilizzata da pensatori come Giulio Cesare Scaligero (1484-1558) per creare ciò che Christoph Lüthy ha recentemente definito un "corpuscolarismo aristotelico". Come si spiega il fatto che una nozione che, nel corso del XIV secolo, aveva perso buona parte del proprio peso teorico possa essere assurta a individuare le componenti essenziali di una visione del mondo "corpuscolarista" due secoli dopo? La soluzione a questo spinoso quesito che è stata suggerita in conclusione del secondo capitolo della tesi consiste nel notare che l'espressione di *minimum naturale* venne fatta propria, nel corso del XIV secolo, da pensatori atomisti come Nicola di Autrécourt (ca. 1295/98-1369) e Giovanni Wyclif (ca. 1330-1384) per indicare alcune delle componenti "primarie" dei corpi naturali. Un'intuizione che sembra dunque importante investigare, per poter rispondere al quesito summenzionato, è quella secondo la quale il XIV secolo vide una biforcazione nell'utilizzo della nozione di *minimum naturale* tra i commenti aristotelici e le opere di pensatori atomisti come Autrécourt e Wyclif. In questa prospettiva, si potrebbe quindi suggerire che pensatori successivi come Scaligero abbiano utilizzato la nozione di *minimum naturale* derivandola dalla tradizione atomistica piuttosto che dalla discussione condotta nei commenti aristotelici precedenti.

Al di là di questo aspetto, del tutto marginale per quanto concerne la ricerca condotta nella presente tesi, ciò che conta sottolineare è che la ricostruzione del dibattito tardoantico e medievale sui *minima naturalia* condotta nel secondo capitolo, insieme all'investigazione condotta nel primo capitolo riguardo alla nozione di continuità e soprattutto di divisibilità infinita in potenza, ha consentito, nel corso del terzo e del quarto capitolo, di impostare in modo più preciso e corretto la ricostruzione del dibatto tardoantico e medievale sui *minima sensibilia*, in particolare di quello latino medievale

compreso tra il 1250 circa e il 1350 circa, che rappresenta il centro dell'indagine condotta nella presente tesi.

Inoltre, giova sottolinearlo, il secondo capitolo della tesi ha altresì mostrato l'importanza del testo di *De sensu* 6, 445b3-446a20 per il dibattito latino medievale sui minima naturalia, un aspetto che non è stato riconosciuto nella letteratura secondaria sui minima naturalia (John Murdoch si è spinto fino all'estremo di negare esplicitamente un ruolo al testo di *De sensu* 6, 445b3-446a20 nel dibattito latino sui *minima naturalia*).

Capitoli 3 e 4 – Il dibattito latino medievale sul problema dei *minima sensibilia* (ca. 1250-ca. 1350)

Se, come già menzionato sopra, la credenza nella divisibilità infinita in potenza delle grandezze (così come del moto e del tempo) fu accettata largamente negli stessi termini da tutti i commentatori latini medievali, come appena visto le posizioni che essi adottarono rispetto al tema dei *minima naturalia* furono invece profondamente diversificate. La ricostruzione della fisionomia del dibattito latino medievale sui *minima naturalia* consente dunque di cominciare a delineare una prima fisionomia del dibattito latino medievale sui *minima sensibilia*. Prima di tutto, la dottrina dei *minima naturalia secundum formam*, almeno nella sua forma più propria, si estende necessariamente anche al dibattito sui *minima sensibilia*, in quanto presuppone che la forma sostanziale di ogni sostanza materiale determini la minima quantità di materia in cui tale forma sostanziale può esistere. Se, d'altronde, si ammette il già ricordato principio aristotelico secondo il quale gli accidenti non possono esistere senza il proprio *subiectum*, bisogna ritenere che la minima quantità di materia in cui una data forma sostanziale può esistere sia anche la minima quantità di materia in cui le forme accidentali delle proprie qualità sensibili possono esistere. Inoltre, come già sottolineato, la dottrina dei *minima secundum sensum* rappresenta non solo una dottrina dei *minima naturalia* ma anche, e a maggior ragione, una dottrina dei *minima sensibilia*, dal momento che l'azione esercitata da una sostanza materiale sui sensi esterni dipende direttamente dalle forme accidentali delle qualità sensibili che ineriscono in essa. Infine, la considerazione del processo di corruzione di una data sostanza materiale (o di una porzione di essa) come temporalmente esteso ha inevitabilmente come conseguenza non solo la negazione dell'esistenza di un *minimum naturale secundum corruptionem* per tale sostanza, ma anche di un qualunque *minimum sensibile secundum corruptionem*. Così come la forma sostanziale, infatti, anche le forme accidentali delle qualità sensibili associate a parti di materia estremamente piccole arriveranno a esistere almeno per un istante nell'intervallo temporale esteso richiesto dal processo di corruzione dell'intero a cui appartengono, in virtù della divisibilità infinita in potenza di tale intervallo temporale esteso.

Ciò detto, non bisogna dimenticare che il dibattito latino medievale sui *minima sensibilia* presenta delle importanti specificità rispetto al corrispondente dibattito sui

minima naturalia. La principale è costituita da un importante aspetto epistemologico (il quale, però, ha anche significative implicazioni ontologiche). Un fondamentale principio della teoria aristotelica della percezione, infatti, è quello secondo il quale una qualità sensibile si definisce sulla base della propria abilità di agire sul senso esterno corrispondente in modo da produrre una sensazione, così che, se non fosse in grado di farlo, tale qualità sensibile esisterebbe invano. Tale principio, significativamente, figura in modo esplicito all'inizio della discussione aristotelica sui *minima sensibilia* in *De sensu* 6, 445b3-446a20. Come ricordato sopra, infatti, tale principio fonda il principale argomento aristotelico contro l'idea che le qualità sensibili siano infinitamente divisibili attraverso la divisione della materia a cui sono associate. Se, infatti, le qualità sensibili fossero infinitamente divisibili attraverso la divisione della materia a cui sono associate, esse potrebbero esistere associate a porzioni di materia così piccole da non consentire loro di poter essere percepite. Inoltre, come altresì ricordato sopra, la soluzione aristotelica all'*aporia* dei *minima sensibilia* si fonda esattamente sull'idea che nessuna porzione di materia potrebbe esistere in atto da sola senza essere percepibile in atto. Ogni porzione di materia al di sotto (o forse anche leggermente al di sopra) della soglia di percepibilità verrebbe infatti corrotta dall'azione del mezzo in cui si trova, perdendo, oltre alla propria forma sostanziale, anche le forme accidentali delle proprie qualità sensibili. Questo modello concettuale garantisce che il mondo naturale esterno rimanga sempre compiutamente percepibile da parte dei sensi esterni. In altre parole, nella prospettiva aristotelica, nessuna qualità sensibile associata a una porzione di materia esistente in atto da sola può sfuggire alla possibilità di essere percepita, in presenza delle condizioni esterne appropriate. Nella tesi si è fatto riferimento a questo importante principio aristotelico come quello della "co-estensione del mondo sensibile e di quello percepibile". Proprio la discussione e la problematizzazione di questo principio, e quindi, correlativamente, del principio secondo il quale una qualità sensibile si definisce sulla base della propria capacità di agire sul corrispondente senso esterno così da produrre una sensazione, rappresenta l'elemento di più forte originalità e specificità del dibattito latino medievale sui *minima sensibilia*, anche rispetto al corrispondente dibattito sui *minima naturalia*.

La discussione a questo proposito, d'altronde, venne in un certo senso iniziata dallo stesso Aristotele nell'oscuro passaggio che chiude la trattazione dei *minima*

sensibilia. In particolare, come detto, in *De sensu* 6, 446a10-15 Aristotele considera che cosa accadrebbe in assenza dell'azione corruttrice del mezzo, e, in tale quadro controfattuale, egli arriva ad ammettere la possibilità dell'esistenza di qualità sensibili associate a porzioni di materia esistenti in atto da sole che non siano percepibili in atto. La nozione di qualità sensibili "impercepibili" si trovò così a essere al centro del dibattito sui *minima sensibilia* condotto dai commentatori del *De sensu* già a partire dall'unico commentatore tardoantico il cui commento al *De sensu* sia pervenuto al Medioevo latino (l'unico commento tardoantico al *De sensu* che si sia preservato, più in generale), ovvero Alessandro di Afrodisia (*fl*. ca. 200 d.C.). Fu infatti Alessandro a sviluppare l'oscuro passaggio aristotelico di *De sensu* 6, 446a10-15 in direzione di una compiuta concezione, che nella tesi viene definita "corpuscolarista", secondo la quale, in assenza dell'azione corruttrice del mezzo, non solo vi potrebbero essere qualità sensibili associate a porzioni di materia esistenti in atto da sole troppo piccole per essere percepibili in atto, ma, secondo il terzo significato di percepibile in potenza distinto da Aristotele, tali qualità sensibili potrebbero diventare percepibili in atto unendosi a una sufficiente quantità di materia dotata delle stesse qualità sensibili. L'influenza del commento di Alessandro nel Medioevo latino a questo proposito fu, peraltro, giova sottolinearlo fin d'ora, resa ancora più significativa dal fatto che l'unico commento al *De sensu* proveniente dal mondo islamico ad aver raggiunto il Medioevo latino, ovvero l'*Epitome* ai *Parva naturalia* di Averroè, non dedica alcuna attenzione specifica al tema dei *minima sensibilia* e, dunque, neppure alla nozione di qualità sensibili "impercepibili" in atto.

Per consentire di apprezzare in pieno, però, la portata di questa discussione, e i suoi sviluppi nel Medioevo latino, è stato necessario, nella tesi, prima di tutto ricostruire in forma compiuta le principali posizioni adottate nel dibattito latino sui *minima sensibilia*.

A tal fine si è prima di tutto voluto fornire una tipologia (o griglia interpretativa) delle posizioni stesse presenti nel dibattito. Evidentemente, non si è potuto procedere, a questo proposito, nello stesso modo in cui si è proceduto per i *minima naturalia*. Infatti, come già ampiamente sottolineato, mentre Aristotele non presentò mai una compiuta dottrina dei *minima naturalia*, nel testo di *De sensu* 6, 445b3-446a20 è invece possibile rintracciare una ben delineata dottrina dei *minima sensibilia*. La dottrina presentata da Aristotele può, secondo la griglia interpretativa già adottata in merito ai *minima naturalia*,

essere caratterizzata primariamente come una dottrina "estrinseca" dei *minima sensibilia*, ovvero una dottrina dei *minima (sensibilia) secundum corruptionem*. In effetti, nella discussione di Aristotele è solo l'azione corruttrice del mezzo a determinare la minima quantità di materia in cui le qualità sensibili possono esistere.

Seguendo la soluzione aristotelica, tutti i commentatori medievali discussi nella tesi (con la possibile eccezione di Alberto Magno) accettarono una dottrina dei *minima sensibilia secundum corruptionem*. Tuttavia, il modo in cui tale dottrina venne caratterizzata dipese da una serie di fattori molto diversi tra loro. Prima di tutto, come già menzionato a proposito del dibattito sui *minima naturalia*, un importante criterio di differenziazione fu rappresentato dal modo in cui la temporalità dell'azione corruttrice del mezzo venne intesa, ovvero come istantanea o temporalmente estesa. Un altro importante criterio di differenziazione a questo proposito fu rappresentato dal fatto che la soglia di percepibilità delle qualità sensibili fosse ritenuta inferiore (o al limite uguale) o superiore a quella necessaria alla loro corruttibilità (ovviamente questo aspetto si dimostrò centrale nel dibattito sulle qualità sensibili "impercepibili", come si mostrerà tra breve). Infine, un terzo criterio di differenziazione dei commentatori medievali in merito alla dottrina dei *minima sensibilia secundum corruptionem* riguardò il riconoscimento o meno di un ruolo causale all'azione del mezzo nella corruzione delle qualità sensibili stesse (tutti i commentatori analizzati nella tesi, d'altronde, con l'eccezione di Tommaso d'Aquino, in analogia con il commento alla *Fisica* dello Pseudo-Sigieri, riconobbero tale ruolo).

Al di là di questo dibattito, tuttavia, il passaggio aristotelico di *De sensu* 6, 446a10-15, consentì ai commentatori medievali, pur accettando una dottrina dei *minima sensibilia secundum corruptionem*, di speculare su cosa accadrebbe in assenza dell'azione corruttrice del mezzo stesso, e dunque di riflettere sulla possibilità di individuare dei limiti "intrinseci" alla divisibilità delle qualità sensibili attraverso la divisione della materia a cui esse sono associate. In assenza del mezzo, in effetti, come detto, Aristotele riconosce esplicitamente un limite alla capacità delle qualità sensibili di essere percepite dai sensi esterni corrispondenti. La riflessione sull'esistenza di *minima sensibilia* "intrinseci", in particolare, si sviluppò a partire dalla traduzione latina del commento al *De sensu* di Alessandro di Afrodisia da parte di Guglielmo di Moerbeke nel 1260, dato che, come già sottolineato, il passaggio aristotelico di *De sensu* 6, 446a10-15, fu oggetto di particolare attenzione da parte di Alessandro. Tutti i commentatori analizzati nella tesi, seguendo

l'autorità aristotelica (e alessandrina), a parte, nuovamente, Tommaso d'Aquino, aderirono all'idea secondo la quale, quantomeno in un mondo possibile privo dell'azione corruttrice del mezzo, vi sarebbero delle minime porzioni di materia esistenti in atto da sole le cui qualità sensibili possano essere percepite in atto. Le qualità sensibili associate a porzioni di materia al di sotto di tale soglia sarebbero, dunque, "impercepibili" in atto. Tuttavia, il modo in cui tale "impercepibilità" venne concepita dai commentatori variò a sua volta in modo molto significativo.

Alcuni commentatori adottarono la posizione secondo la quale le qualità sensibili "impercepibili" in atto non possiedono il potere di svolgere l'operazione a esse propria di agire sui sensi (avvicinandosi dunque a una posizione che potrebbe essere definita, secondo le categorie già adottate per i *minima naturalia*, una dottrina dei *minima sensibilia secundum operationem*). Altri commentatori, invece, sostennero che non solo le qualità sensibili "impercepibili" in atto possiedono in ogni caso il potere di agire sui sensi, ma, per di più, che esse sono sempre "attive", cosicché i limiti alla loro percepibilità dipendono esclusivamente dai poteri dei sensi esterni (secondo la dottrina già definita dei *minima secundum sensum*).

Altri commentatori adottarono invece una dottrina "intrinseca" dei *minima sensibilia* sostanzialmente analoga a quella dei *minima naturalia secundum formam*, sostenendo che, così come le forme sostanziali, anche le forme accidentali delle qualità sensibili determinano, quantomeno in assenza dell'azione corruttrice del mezzo, la (massima e la) minima quantità di materia in cui esse possono esistere. Tale dottrina è stata identificata, nella tesi, col nome di dottrina dei *minima sensibilia secundum formam*, per analogia con la corrispondente dottrina riguardante i *minima naturalia*.

Evidentemente, questa tipologia non può esaurire la ricchezza di sfumature delle posizioni adottate dai commentatori latini medievali analizzati nella tesi riguardo ai *minima sensibilia*, ma contribuisce a fornire un quadro d'insieme importante che ha strutturato l'analisi condotta nel terzo e nel quarto capitolo della tesi (il terzo capitolo della tesi si è focalizzato sul dibattito latino medievale relativo al periodo ca. 1250-ca. 1300, mentre il quarto capitolo si è focalizzato sul dibattito latino medievale relativo al periodo ca. 1300-ca. 1350), i cui principali risultati mi accingo ora a riassumere, seguendo lo stesso ordine espositivo adottato nel caso dei *minima naturalia*.

La posizione sicuramente più radicale tra i commentatori latini che adottarono dottrine "intrinseche" dei *minima sensibilia* è quella rappresentata da Tommaso d'Aquino. Come già ricordato sopra, infatti, Tommaso, traendo le conseguenze della propria dottrina dei *minima naturalia secundum formam*, affermò recisamente, nel proprio commento al *De sensu*, che, se le forme sostanziali delle sostanze materiali (omogenee) determinano la (massima e la) minima quantità di materia in cui esse possono esistere, di conseguenza tale minima quantità di materia rappresenta anche la minima quantità di materia in cui le forme accidentali delle qualità sensibili delle sostanze stesse possono esistere, salvo negare il fondamentale principio aristotelico secondo il quale gli accidenti non possono esistere senza il proprio *subiectum*. Tuttavia, dovendo confrontarsi con la chiara affermazione aristotelica di *De sensu* 6 secondo la quale la corruzione delle qualità sensibili associate a porzioni di materia estremamente piccole che esistono in atto da sole è causata dall'azione corruttrice del mezzo, Tommaso specifica che dividendo la quantità di materia che costituisce il *minimum naturale* (e il *minimum sensibile*) di ogni sostanza materiale essa perde la propria forma sostanziale e le forme accidentali delle proprie qualità sensibili e acquista la forma sostanziale e le qualità sensibili del mezzo stesso, ma, e ciò è cruciale, non per via dell'azione corruttrice del mezzo stesso, bensì per via della debolezza del proprio potere di conservazione. In questo senso, Tommaso, come già accennato, si caratterizza come l'unico commentatore medievale tra quelli analizzati nella tesi (insieme allo Pseudo-Sigieri nel proprio commento alla *Fisica*) a ritenere che l'azione del mezzo non costituisca la causa della corruzione delle qualità sensibili associate a porzioni di materia estremamente piccole che esistono in atto da sole.

Nel secondo capitolo si è evidenziato che Pietro d'Alvernia condivide la dottrina dei *minima naturalia secundum formam*. Tuttavia, nell'ambito del proprio commento al *De sensu*, Pietro d'Alvernia, a differenza di Tommaso, riconosce il ruolo causale dell'azione corruttrice del mezzo nella corruzione delle qualità sensibili associate a porzioni di materia estremamente piccole che esistono in atto da sole. Ciononostante, nel caso di uno scenario controfattuale privo dell'azione corruttrice del mezzo, Pietro d'Alvernia riconosce che le forme accidentali delle qualità sensibili determinerebbero la (massima e la) minima quantità di materia in cui esse possono esistere, in modo tale che le stesse forme accidentali verrebbero immediatamente corrotte (per via della debolezza del proprio potere di conservazione) in porzioni di materia inferiori a tale quantità. In

questo senso, significativamente, la dottrina dei *minima secundum formam* adottata da Pietro d'Alvernia nel dibattito sui *minima sensibilia* non si basa, come in Tommaso, su una mera estensione della dottrina dei *minima naturalia secundum formam*, ma, al contrario, costituisce una compiuta e autonoma dottrina dei *minima sensibilia secundum formam*, ovvero una dottrina che può essere formulata indipendentemente dal riferimento alle forme sostanziali delle sostanze materiali considerate. Significativamente, né Tommaso né Pietro d'Alvernia ammettono (né nella realtà né in uno scenario controfattuale) l'esistenza di qualità sensibili "impercepibili" in atto che esistono da sole. Nella prospettiva da essi adottata, in altre parole, la minima quantità di materia in cui le forme accidentali delle qualità sensibili possono esistere è una quantità di materia sufficiente a consentire a tali forme accidentali di agire sui sensi esterni così da causare delle sensazioni.

Dottrine "intrinseche" dei *minima sensibilia* meno radicali di quella di Tommaso e di quella di Pietro d'Alvernia, come detto, sono le dottrine che ritengono che, quantomeno in un mondo possibile senza l'azione corruttrice del mezzo, sebbene le forme accidentali delle qualità sensibili siano infinitamente divisibili in potenza attraverso la divisione della materia a cui sono associate, non così lo è il loro potere di svolgere l'operazione di agire sui sensi esterni al fine di produrre delle sensazioni. Tali dottrine, in altre parole, ammettono l'esistenza, almeno in un mondo possibile senza l'azione corruttrice del mezzo, di qualità sensibili "impercepibili" in atto. All'interno di tali dottrine, come detto, è possibile identificare una fondamentale linea di faglia. Da un lato, la posizione prevalente tra i commentatori attivi alla Facoltà delle Arti di Parigi (specialmente Rodolfo il Bretone, i due autori anonimi dei commenti a lui contemporanei contenuti nel ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170 e nel ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3061, Giovanni di Jandun e l'anonimo autore del commento preservato nel ms. Paris, Bibliothèque nationale de France, Lat. 16160) consiste nel sostenere che le qualità sensibili "impercepibili" in atto non possiedano il potere di svolgere l'operazione ad esse propria di agire sui sensi esterni così da generare delle sensazioni. Tale posizione potrebbe dunque, come detto, essere considerata una dottrina dei *minima sensibilia secundum operationem*. Dall'altro lato, la posizione prevalente tra i commentatori attivi a Oxford (specialmente Ruggero Bacone, l'anonimo autore del commento preservato nel ms. Oxford, Merton College, 276

e l'anonimo autore del commento preservato nel ms. Oxford, Oriel College, 33; differente è la situazione a Cambridge, come mostra l'anonimo commento preservato nel ms. Cambridge, Gonville and Caius College, 512 (543), forse da attribuire a Giovanni Felmingham) è quella secondo la quale le qualità sensibili "impercepibili" in atto non solo mantengono il potere di agire sui sensi esterni così da produrre delle sensazioni, ma rimangono anche sempre "attive" nei confronti dei sensi stessi. L'impossibilità di percepirle sarebbe dunque, secondo tali commentatori, da imputarsi integralmente alle limitazioni dei poteri sensoriali dei sensi esterni. Tale dottrina è chiaramente riconoscibile come la dottrina, già analizzata nel secondo capitolo, dei *minima secundum sensum*.

Al di là delle prospettive adottate in merito ai *minima sensibilia* "intrinseci", tutti i commentatori medievali analizzati nel terzo e nel quarto capitolo, salvo Alberto il Grande, accettano l'aspetto essenziale della soluzione aristotelica all'*aporia* dei *minima sensibilia* secondo la quale qualità sensibili associate a porzioni di materia estremamente piccole esistenti in atto da sole verrebbero corrotte dall'azione del mezzo in cui si trovano. In altre parole, tutti i commentatori medievali analizzati, a parte Alberto il Grande, accettano una dottrina dei *minima sensibilia secundum corruptionem*. Tuttavia, come menzionato, alcuni dei commentatori analizzati nella tesi mettono in discussione la natura istantanea di tale processo di corruzione, svuotando di significato non solo la nozione di *minima naturalia secundum corruptionem*, come già illustrato sopra, ma anche, correlativamente, quella di *minima sensibilia secundum corruptionem*. Tuttavia, significativamente, l'idea che il processo di corruzione di porzioni di sostanze materiali (omogenee) estremamente piccole che esistono in atto da sole da parte del mezzo avvenga in un intervallo di tempo esteso venne condivisa non solo dai commentatori già studiati a questo proposito nel secondo capitolo di cui sia stato preservato anche (almeno) un commento al *De sensu* (Walter Burley e Giovanni Buridano). Altri commentatori, come Rodolfo il Bretone e gli anonimi autori di due commenti prodotti, come quello di Rodolfo, alla Facoltà delle Arti di Parigi tra la fine del XIII secolo e l'inizio del XIV (quelli preservati nel ms. Vat. Lat. 2170 e nel ms. Vat. Lat. 3061), suggeriscono la stessa idea alcuni decenni prima di Burley e Buridano, senza però, purtroppo, dettagliare a loro concezione.

Altri commentatori, come già menzionato, pur accettando la dottrina *dei minima sensibilia secundum corruptionem*, e indipendentemente dalla considerazione della

struttura temporale del processo di corruzione delle qualità sensibili di porzioni di materia estremamente piccole esistenti in atto da sole, misero in discussione il fondamentale presupposto aristotelico secondo cui la soglia di percepibilità delle qualità sensibili è inferiore (o al limite uguale) a quella della loro corruttibilità. Tra i commentatori che adottarono tale posizione spicca principalmente il nome di Giovanni di Jandun, ma la stessa idea fu condivisa da Walter Burley, da Giovanni Buridano, e dall'anonimo autore di un commento della metà del XIV secolo attribuito sia a Nicola Oresme che ad Alberto di Sassonia.

L'aspetto fondamentale della posizione di tutti i commentatori che sostennero o l'estensione temporale del processo di corruzione delle qualità sensibili associate a quantità estremamente piccole di materia esistenti in atto da sole, o l'idea che la soglia di percepibilità delle qualità sensibili sia superiore a quella della loro corruttibilità (a cui è bene aggiungere anche la posizione di Alberto, il quale, come detto, sviluppa la sua posizione senza tenere minimamente in considerazione l'azione corruttrice del mezzo), è la negazione della validità del principio aristotelico della "co-estensione del mondo sensibile e di quello percepibile". In altre parole, secondo tali commentatori l'esistenza di qualità sensibili "impercepibili" in atto non è solo una possibilità legata a uno scenario controfattuale, ma, molto più concretamente, una caratteristica del mondo naturale esterno.

Per capire pienamente la centralità di questo aspetto per tutto il dibattito latino medievale sui *minima sensibilia*, e anche, più in generale, per la concezione latina medievale dell'ontologia e dell'epistemologia delle qualità sensibili, è opportuno ripercorrere ora in modo più analitico i risultati raggiunti dall'indagine condotta nel terzo e nel quarto capitolo rispetto al tema dell'esistenza di qualità sensibili "impercepibili" in atto, indipendentemente dalla sua considerazione come mera possibilità concettuale o come caratteristica fattuale del mondo naturale esterno.

Il problema dell'esistenza di qualità sensibili "impercepibili" in atto unite a porzioni di materia esistenti in atto da sole figura già in modo significativo nel commento al *De sensu* di Ruggero Bacone, databile ai primi anni '50 del XIII secolo e dunque al periodo in cui, con tutta probabilità, Bacone aveva fatto ritorno a Oxford. In tale commento Bacone ammette chiaramente che, quantomeno in un mondo privo dell'azione corruttrice del mezzo, tali qualità sensibili "impercepibili" in atto esisterebbero

certamente. Tuttavia, Bacone nota, rispondendo a un'obiezione che avrà una sua posterità nel dibattito latino medievale sui *minima sensibilia*, che tali qualità sensibili non esisterebbero senza uno scopo, dato che, seppure incapaci di agire sui sensi esterni così da produrre delle sensazioni, esse servirebbero ancora lo scopo di demarcare il mondo naturale (considerato co-esteso al mondo sensibile) da quello intelligibile.

Il tema dell'esistenza in atto di qualità sensibili "impercepibili" è centrale anche nel commento al *De sensu* di Alberto, databile quasi agli stessi anni. Come detto, Alberto costruisce la sua intera discussione in merito ai *minima sensibilia* senza nemmeno menzionare il ruolo del mezzo (uno scenario che non ha equivalenti presso i commentatori analizzati nella presente tesi). Alberto riconosce dunque esplicitamente che l'esistenza in atto da sole di porzioni di materia troppo piccole per essere percepibili in atto è una caratteristica del mondo naturale esterno. Inoltre, in esplicito confronto con l'atomismo democriteo (un'attitudine già rimarcata nel caso del commento di Alberto al *De generatione*) Alberto chiama tra l'altro tali porzioni di materia *ultima minima* delle sostanze materiali (in quanto dotate di una "minima estensione" di materia e dunque, in un certo senso, costituenti i componenti quantitativi ultimi delle sostanze materiali che possono esistere in atto da soli). Tuttavia, Alberto afferma chiaramente che gli *ultima minima* delle sostanze materiali non possiedono le forme accidentali delle proprie qualità sensibili, bensì esclusivamente le loro *inchoationes*. Ricorrendo così a un concetto tipico della propria metafisica e filosofia naturale, usato tuttavia in modo originale in questo contesto, Alberto illustra secondo un modello "corpuscolarista" la formazione e la struttura delle qualità sensibili percepibili in atto. Nella sua ricostruzione, infatti (ricostruzione che può così porsi in diretto antagonismo con la spiegazione democritea della natura delle qualità sensibili), le qualità sensibili percepibili in atto risultano essere il risultato dell'unione di un certo numero di *ultima minima* dotati delle *inchoationes* di tali qualità sensibili.

Il dibattito in merito all'esistenza di qualità sensibili "impercepibili" in atto divenne, se possibile, ancora più acceso dopo il 1260, quando Guglielmo di Moerbeke tradusse il commento al *De sensu* di Alessandro di Afrodisia. Tommaso d'Aquino fu il primo a riconoscere il "pericolo" di affermare, come Alessandro faceva nel proprio commento, che, in assenza dell'azione corruttrice del mezzo, qualità sensibili "impercepibili" in atto sarebbero tranquillamente potute esistere. In altre parole,

Tommaso negò recisamente la stessa possibilità concettuale dell'esistenza di tali qualità sensibili, affermando che a ogni qualità sensibile deve necessariamente corrispondere un potere sensoriale in grado di percepirla. Una posizione largamente analoga venne poi adottata da Pietro d'Alvernia, come già ricordato.

Tuttavia, già verso la fine del XIII secolo, e specialmente all'inizio del XIV, l'esistenza in atto da sole di qualità sensibili che non sono percepibili in atto cominciò a essere comunemente ammessa non solo nel caso di un mondo privo dell'azione corruttrice del mezzo, ma anche, addirittura, nel mondo naturale esterno effettivamente esistente.

Sebbene tale sviluppo trovi degli antecedenti prossimi in Rodolfo il Bretone e nei due autori dei commenti anonimi preservati nel ms. Vat. Lat. 2170 e nel ms. Vat. Lat. 3061 (e un antecedente più distante, in una certa misura, in Alberto Magno), l'artefice fondamentale di tale sviluppo è Giovanni di Jandun. La centralità della posizione di Jandun nel dibattito latino medievale sui *minima sensibilia* è data, in effetti, proprio dal fatto che egli abbia esplicitamente tematizzato, e discusso nel dettaglio, ben più di ogni altro commentatore latino noto, non solo la possibilità dell'esistenza, sia in uno scenario controfattuale che nel mondo naturale esterno, di qualità sensibili "impercepibili" in atto, ma anche e soprattutto i problemi teorici associati a tale idea.

Il problema essenziale su cui Jandun si concentra riguarda la possibilità per una data entità formale, in questo caso delle forme accidentali delle qualità sensibili, di esistere senza possedere il potere di svolgere l'operazione a essa propria (secondo la nozione di *minima sensibilia secundum operationem* prevalente nel contesto parigino), in questo caso quella di agire sui sensi esterni così da produrre una sensazione. Si tratta, evidentemente, di un problema non relativo esclusivamente alle forme accidentali delle qualità sensibili, e non per nulla attorno a esso si articola, come visto, sia la discussione sui *minima naturalia* dello stesso Jandun che quella di Rodolfo il Bretone. Jandun basa la propria discussione sull'argomento, già citato in precedenza, tratto dal *Commento grande* di Averroè a *Metafisica* Θ.3, secondo il quale un'entità priva del potere di svolgere l'operazione a essa propria perderebbe *ipso facto* la propria essenza. L'argomento di Averroè, originariamente mirante a contestare la dottrina tipica dell'occasionalismo islamico secondo la quale l'unico agente causale nel mondo è Dio stesso, viene così piegato da Jandun a un uso molto distante da quello per cui era stato inizialmente pensato. Per rispondere adeguatamente a tale argomento, senza tuttavia rinunciare alla possibilità

di concepire qualità sensibili "impercepibili" in atto, Jandun arriva a sostenere che, affinché un'entità formale non perda la propria essenza, anche se essa non possiede il potere di svolgere l'operazione a essa propria, è sufficiente che essa possieda la disposizione necessaria ad acquisire tale potere una volta che siano soddisfatti alcune specifiche condizioni di natura contingente. In altre parole, nel caso specifico delle forme accidentali delle qualità sensibili, Jandun afferma che, affinché una data entità possa essere definita come la forma accidentale di una qualità sensibile, è sufficiente che essa possieda la disposizione ad acquisire il potere di agire sul senso esterno corrispondente così da produrre una sensazione una volta che essa si trovi presente in una quantità di materia sufficiente. Al di là di questo, Jandun sostiene in ogni caso che le qualità sensibili possono essere definite tali, anche quando non possiedono il potere di agire sui sensi esterni così da generare delle sensazioni, per il mero fatto che esse consentono di demarcare il mondo naturale esterno da quello matematico e quindi da quello intelligibile (la prossimità con l'analoga osservazione di Bacone è davvero significativa). Jandun afferma, peraltro, che le qualità sensibili "impercepibili" in atto dotate della mera disposizione ad acquisire il potere di agire sui sensi esterni così da generare delle sensazioni rappresentano i componenti ultimi delle qualità sensibili percepibili in atto. Il confronto diretto del proprio modello concettuale con quello democriteo mostra chiaramente che Jandun, come Alberto prima di lui, è pienamente cosciente delle implicazioni "corpuscolariste" della propria posizione.

Come già sottolineato, inoltre, Jandun non intende il proprio modello concettuale come una mera riflessione su ciò che avverrebbe in un mondo privo dell'azione corruttrice esercitata dal mezzo su porzioni estremamente piccole delle sostanze materiali esistenti in atto da sole e sulle loro qualità sensibili. Al contrario, basandosi sul presupposto per cui la soglia di percepibilità delle qualità sensibili è superiore a quella della loro corruttibilità, Jandun afferma che l'esistenza di qualità sensibili "impercepibili" in atto è una caratteristica ineludibile (e permanente) del mondo naturale esterno. In altre parole, secondo Jandun esiste una ben precisa fascia di dimensioni delle sostanze materiali (o di porzioni di esse) all'interno della quale le qualità sensibili possono esistere in atto da sole senza essere percepibili in atto. Per utilizzare la terminologia adottata da Jandun, tali qualità sensibili (e le porzioni di materia a cui esse sono associate) sono *insensibiles*, ma

non *insensibiles omnibus modis*, nella misura in cui possono divenire percepibili in atto unendosi a una sufficiente quantità di materia dotata delle stesse qualità sensibili.

La caratterizzazione delle qualità sensibili in termini disposizionali, prevalentemente non-relazionali e "corpuscolari" adottata da Jandun, nonché la sua applicazione diretta al mondo naturale esterno, esercitò un'influenza decisiva sul dibattito relativo ai *minima sensibilia* contemporaneo e immediatamente successivo, a Parigi e non solo.

Tra i contemporanei, una trattazione largamente analoga a quella fornita da Jandun (ma limitata a uno scenario controfattuale privo dell'azione del mezzo) è presente nel commento anonimo preservato nel ms. Paris, BnF Lat. 16160 (in questo caso è però pressoché impossibile accertare la precisa relazione cronologica col commento di Jandun). Una trattazione del tema dei *minima sensibilia*, inoltre, probabilmente successiva (anche se di poco) a quella di Jandun e influenzata da una posizione analoga a quella adottata da Jandun stesso è la trattazione contenuta nell'anonimo commento del ms. Oriel 33. L'autore di tale commento, pur interpretando le qualità sensibili "impercepibili" in atto come sempre "attive", secondo una tipica posizione del dibattito oxoniense sui *minima sensibilia*, e pur riconoscendo l'esistenza di tali qualità sensibili "impercepibili" in atto esclusivamente in uno scenario controfattuale privo dell'azione del mezzo, si muove largamente nel solco tracciato da Jandun, riconoscendo che, affinché una qualità sensibile sia definita tale, è sufficiente che essa sia percepibile in atto una volta unita a una quantità sufficiente di materia dotata delle stesse qualità sensibili. Inoltre, l'autore di tale commento ricorre (così come l'autore del commento del ms. Paris BnF Lat. 16160) al già ricordato argomento tratto dal *Commento grande* di Averroè a *Metafisica* Θ.3 e, significativamente, lo pone in relazione a un argomento largamente analogo (ma di natura propriamente epistemologica) tratto dal *Commento grande* di Averroè a *Metafisica* H, ma evidentemente mediato dalle *Auctoritates Aristotelis*, secondo il quale, così come il mutamento sostanziale permette di conoscere la materia prima, così lo svolgimento dell'operazione a essa propria consente di conoscere la forma (sostanziale o accidentale).

Il riferimento così significativo al *Commento grande* alla *Metafisica* di Averroè, in una fase cruciale del dibattito latino medievale sui *minima sensibilia*, è un aspetto che merita di essere sottolineato. In effetti, come già ricordato, l'*Epitome* ai *Parva naturalia*

composta da Averroè non contiene neppure un accenno al problema dei *minima sensibilia*. Tuttavia, ciò non rese l'influenza di Averroè sul dibattito latino relativo ai *minima sensibilia* meno significativo. All'influenza, infatti, esercitata attraverso la discussione della dottrina dei *minima (naturalia) secundum formam* (una dottrina dei *minima naturalia*, si ricorderà, fortemente debitrice nei confronti del *Commento grande* alla *Fisica* di Averroè), è da sommare l'influenza esercitata da Averroè tramite i due argomenti summenzionati tratti dal *Commento grande* alla *Metafisica*.

Ciò detto, riprendendo il filo del discorso, è bene sottolineare ancora una volta che l'influenza della dottrina dei *minima sensibilia* di Giovanni di Jandun si dimostrò essenziale nell'accettazione, da parte dei commentatori a lui successivi (a differenza, come visto, di quelli a lui all'incirca contemporanei), dell'esistenza di qualità sensibili "impercepibili" in atto nel mondo naturale esterno. L'idea, infatti, su cui Jandun basò la propria convinzione, ovvero quella secondo la quale la soglia di percepibilità delle qualità sensibili è superiore a quella della loro corruttibilità, venne condivisa, a partire da un certo momento, da Walter Burley (i cui commenti al *De sensu* si pongono peraltro in una relazione cronologica complessa con quello di Jandun), da Giovanni Buridano, e dall'anonimo autore di un commento al *De sensu* attribuito sia a Nicola Oresme che ad Alberto di Sassonia e prodotto pressoché certamente alla Facoltà delle Arti parigina intorno alla metà del XIV secolo (più probabilmente nei primi decenni della seconda metà del secolo).

Nel caso di Burley e Buridano, come detto, tale convinzione fu rafforzata anche dall'accettazione di una concezione temporalmente estesa del processo di corruzione di porzioni di materia estremamente piccole esistenti in atto da sole e delle qualità sensibili a esse associate. Tuttavia, nella tesi si è sottolineato che l'accettazione di quest'ultima concezione può al massimo fondare la credenza nell'esistenza di qualità sensibili "impercepibili" in atto *durante* tale processo di corruzione stesso, dunque qualità sensibili "impercepibili" in atto che, nella tesi, sono state definite "effimere". Al contrario, l'accettazione dell'idea secondo la quale la soglia di percepibilità delle qualità sensibili è superiore a quella della loro corruttibilità fonda la credenza nell'esistenza di qualità sensibili "impercepibili" in atto "permanenti". È proprio l'accettazione dell'esistenza, nel mondo naturale esterno, di quest'ultimo tipo di qualità sensibili "impercepibili" in atto e delle rispettive porzioni di materia a cui esse sono associate (quelle che Buridano

chiamerà *insensibilia propter parvitatem*, e di cui egli riconoscerà la natura di "componenti ultimi", dal punto di vista quantitativo, delle porzioni di materia percepibili in atto), nonché la caratterizzazione di tali qualità sensibili in termini disposizionali, prevalentemente non-relazionali, e "corpuscolaristi", la novità più significativa che emerge dall'analisi del dibattito latino medievale sui *minima sensibilia* del periodo ca. 1250-ca. 1350.

Conclusioni

Cercando ora di riassumere brevemente i principali risultati teorici dello studio del dibattito latino medievale sui *minima sensibilia* del periodo ca. 1250-ca. 1350, è certamente possibile mettere in luce almeno tre punti principali, utili anche per sviluppare l'analisi in direzione degli sviluppi cronologicamente successivi.

Il primo punto che è emerso dall'analisi di tale dibattito condotta nella tesi, e che si è voluta sottolineare in conclusione, riguarda il fatto che nel corso di esso le qualità sensibili abbiano progressivamente perso il carattere "attivo" che le caratterizza nella teoria della percezione e nella filosofia naturale aristoteliche per acquisire un carattere più "passivo" (più precisamente disposizionale), contribuendo così a minare la fondamentale fiducia aristotelica nella capacità umana di possedere un accesso epistemologico all'intero mondo naturale esterno. Pur senza voler suggerire alcun collegamento, è significativo notare che l'idea della natura disposizionale delle qualità sensibili è un aspetto che figura esplicitamente (seppur in un quadro concettuale completamente diverso) nella teoria della percezione di pensatori moderni come Robert Boyle nel XVII secolo e Thomas Reid nel XVIII. Bisogna altresì sottolineare che la concezione "passiva" (disposizionale, meglio) delle qualità sensibili si è sviluppata in parallelo a una concezione maggiormente "attiva" del ruolo dei sensi nel processo di percezione. A questo proposito, però, si è voluta esercitare una particolare cautela nella tesi. Sebbene, infatti, lo sviluppo di una teoria del *sensus agens* (in analogia all'*intellectus agens*) nel Medioevo latino sia fortemente legata proprio al nome di Giovanni di Jandun, nella teoria di Jandun i sensi svolgono un ruolo "attivo" esclusivamente rispetto alle sensazioni già ricevute nei sensi esterni e prodotte dalle qualità sensibili, per cui l'unico agente causale del processo della sensazione rimangono in ogni caso le qualità sensibili stesse (più precisamente, quelle percepibili in atto).

Il secondo punto fondamentale che emerge dall'analisi del dibattito latino medievale sui *minima sensibilia* riguarda il fatto che, attraverso il suo sviluppo, il mondo naturale esterno ha progressivamente acquisito una maggiore autonomia rispetto alla sfera della sensazione. Se, infatti, all'inizio del dibattito latino sui *minima sensibilia*, intorno al 1250, il mondo naturale esterno era considerato interamente percepibile, alla fine del percorso ricostruito nella tesi, intorno al 1350, la situazione era notevolmente

mutata. Certo, era ancora vero che il mondo naturale esterno era considerato interamente sensibile (il possesso di qualità sensibili era addirittura diventato una condizione necessaria per appartenere al mondo naturale esterno), ma esso non era più considerato interamente percepibile. Di conseguenza, si iniziò a prendere coscienza dei limiti della capacità umana di conoscere la struttura ultima della realtà naturale.

Il terzo punto fondamentale emerso a partire dall'analisi del dibattito latino medievale riguardo ai *minima sensibilia* consiste nella sottolineatura della concezione "corpuscolarista" della struttura delle qualità sensibili percepibili in atto che viene adottata prima da Alberto Magno, poi, molto più compiutamente, da Giovanni di Jandun, e, sulla sua scia, da alcuni commentatori successivi, in particolare Giovanni Buridano. In tale concezione, significativamente, i componenti ultimi (dal punto di vista quantitativo) delle qualità sensibili percepibili in atto non sono a loro volta percepibili in atto da soli. Sebbene un tale modello, dal punto di vista ontologico, non trovi un corrispettivo diretto nella prima età moderna, è ben difficile non richiamare alla mente, a questo proposito (nuovamente, senza voler suggerire alcun legame, ma solo una possibilità di confronto), il ruolo che le *perceptions insensibles* (come sottogruppo delle *petites perceptions*) svolgono (esclusivamente, tuttavia, dal punto di vista epistemologico) nel costituire le percezioni di cui si può essere coscienti nell'ambito della teoria della percezione sviluppata da Leibniz, in particolare, nei *Nouveaux Essais sur l'entendement humain*.

Appendice

La tesi è poi completata da un'Appendice che contiene un inventario provvisorio di tutti i testimoni manoscritti di commenti latini al *De sensu et sensato* databili tra il XIII e il XV secolo. La ricerca che ha condotto alla redazione di tale inventario (redatto sulla base di tutti i repertori disponibili contenenti elenchi di testimoni manoscritti a commenti latini medievali di opere aristoteliche) ha costituito un presupposto indispensabile per condurre uno studio dottrinale che, come sottolineato, mirava a prendere in considerazione l'integralità dei commenti latini al *De sensu* preservati databili con certezza tra il 1250 circa e il 1350 circa. Tuttavia, si è ritenuto opportuno includere l'inventario in appendice alla tesi in quanto si auspica che esso possa costituire un utile strumento di lavoro per tutti gli studiosi interessati a svolgere ricerche aventi a oggetto i commenti latini inediti al *De sensu* databili tra il XIII e il XV secolo (che costituiscono, come già menzionato, la larga maggioranza del totale). Nonostante, infatti, almeno due repertori aventi a oggetto direttamente, tra gli altri, i testimoni manoscritti di commenti latini medievali al *De sensu* siano già disponibili, l'inventario fornito in appendice alla presente tesi ne amplia e ne aggiorna i risultati in misura significativa. Non solo, infatti, esso include 93 commenti al *De sensu* (tra letterali et *per quaestiones* e tra attribuiti e anonimi) i cui testimoni manoscritti sono databili tra il XIII e il XV secolo, ma esso include perlomeno due scoperte significative.

In primo luogo, infatti, la ricerca condotta per la preparazione dell'inventario ha consentito di determinare che un importante commento risalente alla fine del XIII o all'inizio del XIV secolo, il commento contenuto nel ms. Merton 276, unanimemente ritenuto anonimo nella letteratura secondaria, contiene lo stesso testo presente anche in un altro testimone manoscritto, il ms. London, British Museum, Add. 18630, dove però il commento è attribuito esplicitamente a Walter Burley (anche se l'attribuzione resta ovviamente da confermare sulla base di una completa analisi paleografica e codicologica del testo contenuto nel manoscritto londinese). In secondo luogo, la ricerca svolta per la preparazione dell'inventario ha consentito di individuare un secondo testimone manoscritto (il ms. Leipzig, Universitätsbibliothek, 1150) del commento al *De sensu* attribuito a Rodolfo il Bretone e conservato nel ms. Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. E.I.252.

Si tratta, come già ampiamente ricordato, di risultati solamente provvisori, ma estremamente importanti per la ricostruzione delle vicende dei commenti latini medievali a un trattato aristotelico, il *De sensu*, la cui importanza non può essere sottovalutata, come, si auspica, la presente tesi ha contribuito a mettere in luce.

Résumé substantiel

Introduction

Cette thèse vise à investiguer un thème de la philosophie de la nature aristotélicienne latine du XIII^{e} et du XIV^{e} siècle qui revêt une grande importance théorique mais qui est encore très peu étudié dans la littérature secondaire (sur lequel, cependant, Aurélien Robert a récemment attiré l'attention dans une contribution pionnière), celui des soi-disant *minima sensibilia*. Cette expression renvoie à l'aporie, évoquée par Aristote (384 av. J.-C.-322 av. J.-C.) dans *De sensu et sensato* 6, 445b3-446a20, concernant les limites de divisibilité des qualité sensibles (c'est-à-dire les sensibles propres aux cinq sens externes, couleurs, sons, odeurs, goûts, et les qualités tangibles) à travers la division de la matière à laquelle elles sont associées (la discussion s'inscrit d'ailleurs dans un cadre conceptuel plus large, puisqu'elle est précédée, dans le chapitre, par celle relative aux limites de divisibilité des qualités sensibles en espèces à l'intérieur de chacun de leurs genres). L'aporie se pose, en particulier, dans les termes suivants : si la matière est infiniment divisible en puissance, en tant que continue, qu'advient-il des qualités sensibles qui lui sont associées lors de la division de la matière elle-même ?

Si, d'une part, note Aristote, on admettait que les qualités sensibles sont divisibles à l'infini en puissance par la division de la matière à laquelle elles sont associées, il faudrait admettre qu'il existe dans la nature une puissance capable de les percevoir (étant donné que les qualités sensibles se définissent à partir de leur capacité à agir sur les sens), contrairement à la croyance aristotélicienne profonde selon laquelle toute puissance dans la nature a une intensité finie. D'autre part, s'il devait être admis que les qualités sensibles ne sont pas infiniment divisibles en puissance par la division de la matière à laquelle elles sont associées, il faudrait reconnaître que les composants ultimes des corps sensibles sont des entités dépourvues de qualités sensibles. De plus, de telles entités, en tant que dépourvues de qualités sensibles, seraient complètement au-delà de toute possibilité d'être connues. En effet, non seulement elles ne pourront pas être connues par les sens, étant dépourvues de qualités sensibles, mais elles ne pourront même pas être connues par

l'intellect, étant donné que la seule possibilité épistémique d'accès au monde naturel extérieur, pour l'intellect, est justement constituée par les sens.

La solution aristotélicienne de l'aporie repose sur une distinction soigneuse, tout d'abord, entre la perceptibilité potentielle et la perceptibilité en acte, et, de plus, sur une distinction entre trois notions différentes de perceptibilité potentielle. Grâce à ces distinctions conceptuelles, Aristote peut affirmer que chaque portion de matière, aussi petite soit-elle, est perceptible en puissance en tant qu'elle contribue à la perceptibilité en acte du tout auquel elle appartient. Cependant, lorsqu'une portion de matière est "physiquement" séparée du tout auquel elle appartient, deux cas peuvent se présenter. Au dessus d'un certain seuil de petitesse, cette portion de matière deviendra perceptible en acte par elle-même, et, de ce point de vue, on pourra affirmer qu'elle était perceptible en puissance comme partie du tout auquel elle appartenait dans un second sens de 'perceptible en puissance'. En dessous de ce seuil de petitesse, au contraire, la portion de matière considérée ne peut pas devenir perceptible en acte par elle-même. Néanmoins, en dessous de ce même seuil (ou peut-être même légèrement au-dessous), la portion de matière considérée sera immédiatement corrompue par l'action du milieu dans lequel elle se trouve, perdant ainsi ses qualités sensibles et acquérant celles du milieu lui-même. Selon l'important exemple mentionné par Aristote à cet égard, une goutte d'un liquide savoureux (du vin, par exemple) versée dans la mer perdra immédiatement ses qualités sensibles (en particulier, sa saveur, mais aussi sa couleur, etc.,…) et elle acquerra celles de la mer. À ce point, cependant, Aristote complique encore le tableau que nous venons de résumer, dans un passage assez obscur mais d'une importance fondamentale pour les commentateurs. Dans ce passage (du moins tel qu'il a été lu par les commentateurs), Aristote note qu'en l'absence de l'action corruptrice exercée par le milieu, même des portions de matière extrêmement petites (et bien en dessous du seuil de corruptibilité que nous venons de mentionner) resteraient perceptibles en puissance (selon un troisième et distinct sens de l'expression), dans la mesure où elles pourraient devenir perceptibles en acte en s'unissant à une quantité suffisante de matière douée des mêmes qualités sensibles.

Le but de cette thèse a été d'analyser la manière dont les commentateurs latins médiévaux au *De sensu et sensato* actifs (environ) entre 1250 et 1350 discutèrent le problème des *minima sensibilia*, sans négliger de lire leurs interprétations à la lumière de

celles des commentateurs de l'Antiquité tardive et du monde islamique. À cette fin, tous les commentaires latins au *De sensu* qui peuvent être datés avec certitude à l'intérieur de cette période chronologique ont été pris en considération. La thèse se caractérise donc comme un travail minutieux d'exégèse textuelle mené à propos d'un aspect extrêmement ponctuel (et presque jamais étudié auparavant) de la tradition latine aristotélicienne de la période comprise entre le milieu du XIII^{e} siècle et le milieu du XIV^{e} siècle. L'intuition qui a animé cette recherche est à la fois théorique et méthodologique.

Du point de vue théorique, l'intuition sur laquelle repose la thèse est celle selon laquelle les interprétations données à la solution aristotélicienne du problème des *minima sensibilia* par les commentateurs latins médiévaux constituent un point d'accès privilégié pour étudier la conception des qualité sensibles adoptées par ces mêmes commentateurs, tant du point de vue de leur constitution ontologique comme formes accidentelles des substances matérielles, que de celui des conditions nécessaires à leur action sur les sens externes, et donc à leur perceptibilité du point de vue épistémologique.

Du point de vue méthodologique, l'intuition sur laquelle repose la thèse est celle selon laquelle une analyse globale de tous les commentaires d'un passage spécifique d'un traité aristotélicien produits dans la période de temps mentionnée ci-dessous et encore conservés représente une méthode d'enquête particulièrement utile pour étudier des questions spécifiques de la philosophie de la nature aristotélicienne au Moyen Âge latin. En particulier, cette méthode présente le grand avantage de ne pas donner une centralité apriorique aux positions de certains commentateurs considérés comme les principaux, et de viser au contraire à reconstruire un tableau d'ensemble aussi détaillé que possible dans lequel chaque commentateur, connu ou anonyme, se voit reconnue, en principe, la même importance. Ceci est d'autant plus crucial dans le cas des commentaires au *De sensu*, qui sont restés dans l'oubli jusqu'à des temps très récents (au point que, sur plus de trente certainement datables à l'intérieur de la période concernée par la thèse, seuls cinq ont reçu une édition critique complète, et seuls deux autres ont été imprimés dans des éditions du XV^{e} et du XVI^{e} siècle).

Chapitre 1 – La continuité des grandeurs et leur divisibilité infinie en puissance chez Aristote et ses commentateurs de l'Antiquité tardive et du Moyen âge

Afin de pouvoir reconstruire correctement le débat latin médiéval sur les *minima sensibilia* pour la période ca. 1250-ca. 1350, cependant, il a fallu tout d'abord investiguer ses présupposés.

Le premier parmi eux, c'est celui de la divisibilité infinie en puissance de la matière (considérée comme une grandeur étendue) des substances matérielles à laquelle les qualités sensibles sont associées dans la perspective aristotélicienne. La divisibilité infinie en puissance des grandeurs est, chez Aristote comme chez ses commentateurs, intimement liée à la propriété de la continuité, au point d'en apparaître comme un corrélat inévitable et, dans certains cas, même l'élément marquant. Certes, les études concernant la doctrine aristotélicienne de la continuité des grandeurs et de leur divisibilité infinie en puissance ne manquent pas, ainsi que les études concernant les interprétations d'une telle doctrine par les commentateurs de l'Antiquité tardive et (quoique dans une moindre mesure) du Moyen Âge. Cependant, en regardant ces études, il devient immédiatement clair que les points discordants et controversés abondent, et pas seulement à propos des détails mineurs, mais aussi à propos des aspects centraux de la doctrine aristotélicienne de la continuité des grandeurs et de leur divisibilité infinie en puissance et de ses interprétations dans l'Antiquité tardive et au Moyen Âge. Pour n'en citer que quelques-uns (d'ailleurs d'une importance fondamentale pour le débat latin médiéval sur les *minima sensibilia*) : la divisibilité infinie en puissance représente-t-elle la définition de la continuité ? Quelle est la différence entre la continuité et la divisibilité infinie en puissance des grandeurs géométriques et "physique" (c'est-à-dire des substances matérielles) ? Existe-t-il une limite conceptuelle à la divisibilité infinie en puissance des quantités ? Plus en général, comment faut-il comprendre la notion de puissance associée à la divisibilité infinie des grandeurs, c'est-à-dire une notion de puissance qui ne peut jamais être traduite en acte ?

Le premier chapitre de la thèse visait donc à réexaminer ces questions (et d'autres semblables) à travers une analyse directe et ponctuelle de quelques-uns des principaux passages aristotéliciens qui présentent la doctrine de la continuité des grandeurs et de leur divisibilité infinie en puissance (*Catégories* 6, *Métaphysique* Δ.6, Δ.13 et I.1, *Physique*

V.3 et VI.1-2, ainsi que *De generatione et corruptione* I.2 et I.8), ainsi que les interprétations de ces passages fournies par les commentateurs de l'Antiquité tardive, par Averroès (1126-1198) et par certains commentateurs latins des XIII^{e} et XIV^{e} siècles (Albert le Grand, Thomas d'Aquin, Jean Duns Scot et Jean Buridan), choisis en tant qu'échantillon représentatif soit pour l'importante intrinsèque de leur analyse des passages aristotéliciens concernés soit pour leur position chronologique dans le cadre temporel étudié par cette thèse.

L'analyse effectuée dans le chapitre nous a permis de mettre en évidence certains aspects de grande importance à la fois pour les études sur la continuité des grandeurs et sur leur divisibilité infinie en puissance dans la tradition aristotélicienne et pour la reconstruction du débat latin médiéval sur les *minima sensibilia*.

Évidemment, tous les commentateurs analysés, à la suite d'Aristote, ne mirent jamais en doute le fait que les grandeurs, à la fois "physiques" (les substances matérielles) et géométriques, sont continues et infiniment divisibles en puissance. Cependant, un changement important dans la conception de la relation réciproque entre les deux propriétés se produisit clairement dans le passage des textes aristotéliciens aux interprétations qui en ont été fournies d'abord par les commentateurs de l'Antiquité tardive, puis par les commentateurs médiévaux.

Pour comprendre ce changement, il faut tout d'abord rappeler que chez Aristote la propriété de la continuité des grandeurs est analysée selon deux perspectives complémentaires mais nettement distinctes.

La première, qui prévaut tant dans le sixième chapitre des *Catégories* qu'en *Physique* V.3 et dans la *Métaphysique*, consiste à interpréter la continuité comme la propriété qui fonde l'unité (au moins le premier et le plus bas degré d'unité *per se*, selon la perspective de *Métaphysique* Δ.6) d'une grandeur. En d'autres termes, la propriété de la continuité, selon une telle perspective, garantit qu'une quantité est méréologiquement simple au sens de ne pas posséder des parties distinctes l'une de l'autre en acte. Plus précisément, tout couple de parties d'une grandeur continue qui sont contiguës (c'est-à-dire, selon la définition donnée par Aristote dans *Physique* V.3, des parties qui se succèdent et dont les extrémités se touchent), est également continue (c'est-à-dire, toujours selon la définition donnée dans *Physique* V.3, un couple de parties dont les extrémités sont une). Les parties d'une entité continue ne peuvent revenir à l'existence en

acte que par une division de cette entité même. Cependant, ce n'est pas la divisibilité infinie en puissance qui est centrale dans cette première perspective d'analyse de la continuité adoptée par Aristote, mais plutôt ce qu'Aristote, comme mentionné, reconnaît comme la définition de la propriété de la continuité donnée dans *Physique* V.3, c'est-à-dire la conception de la continuité comme produit de l'union des extrémités de deux entités et, par conséquent, comme ce qui caractérise toute entité dont les parties ont les extrémités unie entre elles.

La deuxième perspective d'analyse de la continuité chez Aristote est, en revanche, celle qui prévaut dans *Physique* VI.1-2 et dans *De generatione* I.2 et I.8. Dans ces textes, Aristote se confronte, directement ou indirectement, à la position des atomistes (notamment Démocrite et Leucippe). Une telle position est déclarée par Aristote lui-même, à plusieurs reprises, comme digne d'une grande estime pour sa puissance explicative et pour l'économie des principes qu'elle adopte et, pour les mêmes raisons, comme la principale rivale de sa propre explication de la composition du monde naturel et des processus qui le caractérisent. Étant donné que la conception du monde naturel proposée par les atomistes repose précisément sur l'idée d'atomes physiquement (mais pas conceptuellement) indivisibles placés dans le vide, il est évident que, pour la réfuter, Aristote attribue une importance centrale, tant en *Physique* VI.1-2 que dans *De generatione* I.2 et I.8, à la notion de divisibilité infinie en puissance. En *Physique* VI.1-2 Aristote, partant de la définition de la continuité donnée en *Physique* V.3, énonce clairement que tout ce qui est continu (grandeurs, mais aussi, de façon dérivée, mouvement et temps) est divisible à l'infini en puissance (dans la mesure où les extrêmes dont l'union a généré une entité continue peuvent toujours être à nouveau divisés), puis présente des arguments importants (de nature à la fois géométrique et "physique") contre l'idée de l'existence de composants ultimes indivisibles du monde naturel. D'autres arguments sont introduits dans *De generatione* I.8. Cependant, un texte particulièrement important pour cette thèse, c'est celui de *De generatione* I.2, où Aristote adresse l'une des principales objections à la notion de divisibilité infinie en puissance. L'objection prend la forme d'un dilemme : si une entité infiniment divisible en puissance est effectivement divisée jusqu'à ses derniers composants, que restera-t-il ? Si quelque chose échappait au processus de division, il viendrait à constituer une composante « indivisible » de cette entité. Cependant, s'il ne restait rien, il n'y aurait pas de composants ultimes des entités

continues (ou, à la limite, ces composants seraient des entités sans extension, c'est-à-dire des points), ce qui constituerait un paradoxe évident. La solution aristotélicienne au dilemme consiste à souligner que la notion de puissance propre à la divisibilité infinie en puissance des entités continues est une notion particulière de puissance qui ne peut jamais être traduite en acte, non seulement physiquement, mais même conceptuellement.

Pour illustrer ce concept, Aristote utilise l'exemple géométrique de la division d'une ligne en tous ses points. Il faut souligner que pour Aristote un point, étant dépourvu d'extension, ne peut pas être une partie d'une grandeur, telle qu'une ligne. Au contraire, le point ne peut constituer que la limite d'une telle grandeur, dont il dépend ontologiquement. En d'autres termes, les parties d'une ligne sont des lignes (segments) délimitées par deux points chacune, correspondant aux points où la ligne initiale est divisée. Partant de cette conception, Aristote affirme qu'une ligne est bien divisible en chacun de ses points, mais pas en tous ses points. Ce qu'Aristote veut dire, c'est que, puisqu'un point ne peut jamais exister de façon autonome, mais exclusivement comme limite d'une ligne (d'un segment), il est impossible qu'une ligne soit divisée en deux points « immédiatement proches » l'un de l'autre. En d'autres termes, entre deux points distincts actualisés par la division d'une même ligne, il doit toujours exister une autre ligne, et ainsi le processus de divisibilité infinie en puissance d'une ligne ne peut jamais être pleinement actualisé, pas même conceptuellement. C'est en ce sens que la notion de divisibilité infinie en puissance adoptée par Aristote est capable d'échapper au dilemme discuté dans *De generatione* I.2 et est en même temps capable d'acquérir une centralité absolue dans la seconde perspective aristotélicienne d'analyse de la continuité.

Les deux perspectives aristotéliciennes d'analyse de la continuité, cependant, eurent, dès le départ, un poids différent chez les commentateurs. Déjà dans l'Antiquité tardive, en effet, comme le montrent surtout les commentaires aux *Catégories*, la première perspective fut progressivement éclipsée par la seconde, et la notion de continuité fut presque toujours analysée en termes de divisibilité infinie en puissance. Cela était certainement dû, dans une certaine mesure, aussi à la nécessité pour ces commentateurs de réfuter une position atomiste qui, directement ou indirectement, se voulait invulnérable à la critique aristotélicienne, à savoir celle d'Épicure (341 av. J.-C.-270 av. J.-C.). Une tâche importante des commentateurs aristotéliciens de l'Antiquité tardive était donc de montrer si et comment les arguments d'Aristote (ou d'autres

arguments développés *ex novo* à l'appui de la position aristotélicienne) pouvaient être utilisés contre un atomisme qui identifiait les composantes ultimes de la réalité non pas avec des atomes qui ne sont que "physiquement" indivisibles, mais avec des minimums qui sont aussi indivisibles d'un point de vue conceptuel. Ce processus, si possible, s'accentua encore au Moyen Âge, tant dans le monde islamique (où une autre forme d'atomisme sensiblement similaire à celle épicurienne apparut rapidement, celle théologique du *Kalām*) que dans le monde latin. Parmi les commentateurs latins, en particulier, Albert le Grand (ca. 1200-1280) et Thomas d'Aquin (ca. 1225-1274) allèrent jusqu'à soutenir que la divisibilité infinie en puissance représente un *alia definitio* de la continuité, parallèlement à (pas, cependant, à la place de) celle donnée dans *Physique* V.3.

La mise en exergue de la relation entre continuité et divisibilité infinie en puissance, chez les commentateurs latins, semble être liée, au moins en partie, à l'influence d'un autre courant doctrinal, à savoir celui de la tradition géométrique représentée par les *Éléments* d'Euclide, dont Albert fut lui-même, soit dit en passant, commentateur. Cette tradition favorisa considérablement le développement d'autres arguments géométriques contre les positions « indivisibilistes », arguments différents de ceux présentés en germe par Aristote, mais surtout de ceux présentés de manière beaucoup plus développée par les commentateurs de l'Antiquité tardive et en particulier par les représentants de la tradition islamique, tels qu'Avicenne (vers 970-1037), al-Ghazali (vers 1056-1111) et Averroès. La tentative d'analyse géométrique complète de la continuité des grandeurs (et, par voie de conséquence, du mouvement et du temps) et de leur divisibilité infinie en puissance atteignit un de ses sommets dans le deuxième livre de l'*Ordinatio* de Jean Duns Scot (1265/1266-1308), dans le cadre d'une discussion sur le thème du mouvement angélique. Cependant, il est important de rappeler que, malgré l'importance acquise par l'analyse géométrique de la continuité des grandeurs (ainsi que du mouvement et du temps) chez les commentateurs latins, aucun d'entre eux n'oublia jamais que cette analyse ne concernent finalement pas des entités purement conceptuelles, mais les substances matérielles (ou le mouvement et le temps) dont les entités géométriques elles-mêmes sont, du point de vue aristotélicien, abstraites.

Le processus qui conduisit, dans le passage d'Aristote à ses commentateurs de l'Antiquité tardive puis médiévaux, à adopter une perspective dans laquelle la divisibilité

infinie en puissance prit un rôle absolument central dans l'analyse de la continuité est rendu encore plus évident par le fait que, progressivement, les commentateurs utilisèrent des outils nouveaux et plus variés pour l'analyse conceptuelle de la propriété même de la divisibilité infinie en puissance. Comme il a déjà été mentionné, en effet, chez Aristote l'idée selon laquelle la division infinie d'entités continues ne peut jamais être achevée (même pas, par l'absurde, en imaginant de disposer d'un temps infini), repose sur l'impossibilité « topologique » de diviser une entité continue en deux points « immédiatement proches » l'un de l'autre. Bien que cette idée soit clairement restée présente aussi bien chez les commentateurs de l'Antiquité tardive que chez les commentateurs médiévaux, une conception fondée sur l'idée d'une impossibilité logique de diviser une entité s'y ajouta progressivement, notamment chez les commentateurs latins médiévaux. Plus précisément, les commentateurs latins, déjà à commencer par Albert le Grand, mais plus largement avec Jean Duns Scot puis avec Jean Buridan (ca. 1300-ca. 1361), utilisèrent les outils de la logique modale pour montrer que la proposition universelle selon laquelle une entité continue peut être divisée en tous ses points implique une impossibilité logique. Dans la perspective d'Albert et, bien que dans une façon beaucoup plus raffinée, de Duns Scot, cette impossibilité est liée à une incompossibilité découlant de la conjonction des propositions singulières relatives à la possibilité de diviser une entité continue en chacun de ses points. Dans la perspective de Buridan, en revanche, cette impossibilité est liée à la traduction de la proposition universelle de possibilité selon laquelle une entité continue peut être divisée en tous ses points en la proposition universelle assertive correspondante selon laquelle une entité continue est (a été) divisée en tous ses points.

En résumant, au-delà de toutes ces distinctions conceptuelles, l'analyse menée dans le premier chapitre de la thèse montre bien que la croyance dans la continuité des grandeurs (et surtout celle dans leur divisibilité infinie en puissance) est profondément enracinée non seulement dans la philosophie de la nature d'Aristote mais aussi dans celle de ses commentateurs, tant de l'Antiquité tardive que médiévaux. Reprenant la terminologie adoptée par Imre Lakatos dans son analyse des processus de recherche scientifique, on pourrait affirmer que la croyance à la continuité des grandeurs (et surtout celle à leur divisibilité infinie en puissance) fait partie du noyau dur, et pas seulement de la ceinture de protection, de la philosophie de la nature d'Aristote et de celle de ses

commentateurs de l'Antiquité tardive et du Moyen Âge. La reconnaissance de la centralité que la croyance, en particulier, à la divisibilité infinie en puissance des grandeurs (ainsi que du mouvement et du temps) eut dans toute la tradition aristotélicienne, tant dans l'Antiquité tardive qu'au Moyen Âge, a également permis, entre autres choses, de souligner que le débat sur les *minima sensibilia*, contrairement à ce que l'on pourrait penser à première vue, ne peut en aucun cas être considéré comme un épisode de l'histoire de l'atomisme ou même simplement du corpuscularisme, bien que, comme on le voit, il n'y ait pas de pénurie de points de contact (plutôt, comme le suggère la thèse, le débat sur les *minima sensibilia* peut être plus utilement analysé dans le cadre conceptuel du problème de la « persistance » des formes, dans ce cas accidentelles, à travers la division de la matière à laquelle elles sont associées).

Au contraire, c'est précisément en vertu du fait que la croyance à la divisibilité infinie en puissance des grandeurs est toujours restée si ancrée dans la tradition aristotélicienne de l'Antiquité tardive et du Moyen Âge que le débat sur les *minima sensibilia* y acquit une urgence particulière.

Chapitre 2 – Le débat latin médiéval sur les *minima naturalia* : un réexamen

Avant de pouvoir aborder directement le développement du débat sur les *minima sensibilia*, la thèse a dû faire face à un autre aspect. Les qualités sensibles, en effet, ne sont pas conçues, dans la vision aristotélicienne du monde, comme des entités dotées d'une autonomie ontologique. Autrement dit, pour exister, les qualités sensibles, ou plutôt leurs formes accidentelles, doivent inhérer dans une substance matérielle composée de matière et d'une forme substantielle. Par conséquent, la solution du problème des limites à la divisibilité des formes accidentelles des qualités sensibles à travers la division de la matière à laquelle elles sont associées exige, en premier lieu, la solution du problème des limites à la divisibilité des formes substantielles qui informent cette matière elle-même, le soi-disant problème des *minima naturalia*. En effet, si l'on devait reconnaître qu'il y a une limite à la divisibilité des formes substantielles à travers la division de la matière qu'elles informent, il faudrait aussi reconnaître que cette limite s'applique aussi à la divisibilité des formes accidentelles des qualités sensibles, à moins qu'on veuille nier le principe aristotélicien fondamental selon lequel un accident ne peut jamais exister sans son propre *subiectum*. Certes, le texte du *De sensu* 6, 445b3-446a20 ne fait pas référence aux formes substantielles, mais la conscience du lien très étroit entre les deux aspects est apparue très tôt chez les commentateurs, et elle a constitué un aspect significatif du débat latin médiéval sur les *minima sensibilia*.

Le deuxième chapitre de la thèse s'est donc attaché à reconstruire le débat sur les *minima naturalia* à partir des principaux passages aristotéliciens auxquels il a été lié par les commentateurs (en particulier *Physique* I.4), en suivant toutes ses phases de développement chez les commentateurs de l'Antiquité tardive, puis chez les commentateurs médiévaux. Parmi les commentateurs médiévaux, Averroès a été reconnu une nouvelle fois comme ayant un rôle prépondérant dans le monde islamique, compte tenu du fait que l'influence du débat islamique sur le Moyen Âge latin passa, à propos du thème des *minima naturalia*, exclusivement par ses commentaires. Quant au Moyen Âge latin, nous avons essayé de donner la priorité, tout d'abord, aux commentateurs actifs entre 1250 environ et 1350 environ qui ont également traité le thème des *minima sensibilia*, afin de permettre au lecteur de se faire une image complète des positions respectives de ces commentateurs à propos des *minima naturalia* et des *minima sensibilia*.

En même temps, cependant, nous avons également essayé de focaliser l'attention sur certains commentateurs qui, bien qu'ils ne présentent pas une position spécifique sur le sujet des *minima sensibilia*, ont eu une importance centrale pour le débat latin médiéval sur le sujet des *minima naturalia*, influençant ainsi (au moins indirectement) aussi le débat latin sur les *minima sensibilia*. Notons également que, contrairement à ce qui a déjà été souligné pour le débat latin médiéval sur les *minima sensibilia*, le débat correspondant sur les *minima naturalia* a déjà fait l'objet d'importantes investigations doctrinales dans la littérature secondaire, à commencer par les travaux pionniers de Pierre Duhem et puis surtout grâce aux analyses minutieuses d'Anneliese Maier et de John Murdoch. Cependant, la publication récente d'un nombre remarquable d'éditions critiques de commentaires latins médiévaux (en particulier à la *Physique*) dans lesquels le thème des *minima naturalia* est explicitement abordé, ainsi que la plus grande disponibilité d'informations concernant la tradition manuscrite des commentaires encore inédits, légitime, au moins c'est ce que nous croyons, une mise à jour des résultats obtenus jusqu'à présent dans la littérature secondaire, évidemment pas dans le but de les remplacer et de les remettre radicalement en question, mais, plutôt, de les approfondir, de les compléter et parfois de les corriger à la lumière d'un cadre conceptuel global plus ramifié et plus développé.

Le point de départ du chapitre a été, comme mentionné, l'analyse des passages aristotéliciens à partir desquels le débat des commentateurs concernant les *minima naturalia* prit son essor. Comme cela a été largement reconnu, Aristote n'a pas de doctrine des *minima naturalia* dotée d'une physionomie reconnaissable, contrairement à ce qui se passe, en revanche, dans le cas des *minima sensibilia*. Cependant, comme déjà mentionné, il y a au moins un passage qui, chez les commentateurs, fut associé d'une manière particulière au sujet des *minima naturalia*, c'est-à-dire le quatrième chapitre du Livre I de *Physique*. Dans ce chapitre, Aristote, dans le cadre d'une doxographie globale des positions de ses prédécesseurs sur les principes de la nature, confronte directement la position d'Anaxagore, et en particulier sa double thèse selon laquelle tout est dans tout et tout est engendré à partir de tout. Parmi les arguments par lesquels Aristote oppose la double thèse anaxagorienne figure celui selon lequel il n'est pas possible que tout soit dans tout, et que tout soit engendré à partir de tout, car il y a des limites aux dimensions des êtres vivants et donc, nécessairement, même à celles de leurs composants homogènes.

Par conséquent, au-delà de ces limites, il ne sera plus vrai que tout est dans tout et que tout est engendré à partir de tout. L'argument, il faut le remarquer, distingue déjà les êtres vivants, entendus comme substances hétérogènes, et leurs composants homogènes, permettant ainsi d'opérer une distinction qui aurait joué un rôle central dans le débat postérieur sur les *minima naturalia*. Aucun des commentateurs analysés dans la thèse, en effet, ne mit jamais en doute l'existence d'un seuil de petitesse en dessous duquel une substance hétérogène (un être vivant) pourrait conserver sa nature ; le cas véritablement controversé, celui sur lequel se concentra le débat sur les *minima naturalia*, surtout le débat latin, concerne justement les substances homogènes (la thèse s'est donc concentrée sur ce cas dans la reconstruction du débat sur les *minima naturalia* et, pour cohérence, également dans la reconstruction du débat sur les *minima sensibilia*). Néanmoins, il est important de noter que si l'argument aristotélicien anticipe une distinction importante propre au débat postérieur, il lui manque cependant ce qui aurait constitué son élément central. L'argument aristotélicien (ainsi que plus généralement toute la discussion menée en *Physique* I.4), en effet, n'est pas formulé en termes hylémorphiques, et ce pour la simple raison que la forme, comme principe de la nature, sera introduite par Aristote seulement en *Physique* I.7.

Ce n'est qu'à partir des commentateurs de l'Antiquité tardive, et, parmi eux, en particulier à partir de Jean Philopon (ca. 490 ap. J.-C.-ca. 570 ap. J.-C.), que l'argument aristotélicien de *Physique* I.4 sera reformulé en termes explicitement hylémorphiques. Dans l'analyse de Philopon, l'argument d'Aristote, conçu explicitement en termes d'un véritable « axiome », consiste à affirmer que tout corps naturel peut être conçu de deux manières : d'une part comme une simple grandeur continue, d'autre part comme un composé hylémorphique de matière et de forme. Du premier point de vue, il n'y a évidemment pas de limites à la division du corps considéré, précisément car sa nature continue implique sa divisibilité infinie en puissance. Du second point de vue, cependant, le corps considéré rencontre une limite précise à sa divisibilité. En effet, si sa matière est infiniment divisible en puissance car elle est continue, sa forme ne l'est pas. Plus précisément, Philopon constate qu'en dessous d'un certain seuil de petitesse (comme d'ailleurs au-dessus d'un certain seuil de taille) la forme d'un corps « se réduit » jusqu'à ce qu'elle soit complètement perdue (Philopon se sert à cet égard d'un verbe qui représente

presque un néologisme dans le lexique philosophique grec, un aspect qui indique donc *a fortiori* la nouveauté théorique du concept auquel il est associé).

La discussion de Philopon pose ainsi le problème des *minima naturalia* clairement dans un cadre conceptuel tout à fait hylémorphique. C'est à partir de ce tournant que le débat médiéval sur les *minima naturalia* put clairement s'articuler selon une physionomie reconnaissable. Cependant, afin de pouvoir reconstituer adéquatement ce débat, il a été jugé indispensable, dans le chapitre, de fournir une typologie préliminaire (une grille interprétative) des positions adoptées par les commentateurs médiévaux, permettant ainsi une lecture plus aisée et une possibilité plus immédiate de comparaison.

En synthèse extrême, on a souligné que les positions médiévales sur le problème des *minima naturalia* se répartissent en deux grands groupes, celui des doctrines « intrinsèques » des *minima naturalia* et celui des doctrines « extrinsèques ».

Le terme de doctrines « intrinsèques » des *minima naturalia* désigne toutes les doctrines qui considèrent l'existence des *minima naturalia* dans les substances matérielles (en particulier, comme on l'a dit, l'attention s'est focalisée sur le cas des substances homogènes) comme dépendant de facteurs internes à ces substances elles-mêmes. En d'autres termes, selon ces doctrines, même en considérant une substance matérielle (homogène) en l'isolant du milieu dans lequel elle se trouve, et aussi de toute relation éventuelle avec d'autres substances, il est possible d'identifier en elle un seuil de petitesse en dessous duquel sa structure métaphysique subit des changements importants. La doctrine « intrinsèque » la plus radicale des *minima naturalia* est certainement celle selon laquelle la forme substantielle de toute substance matérielle détermine la quantité (maximale et) minimale de matière qu'elle peut informer, et dans laquelle elle peut donc exister. Selon cette doctrine, en dessous de cette quantité minimale de matière, la forme substantielle de la substance matérielle considérée est immédiatement corrompue. L'expression qui a été adopté dans la thèse pour décrire cette première doctrine « intrinsèque » des *minima naturalia* (formulation originale construite en analogie avec les expressions utilisées dans la littérature secondaire pour désigner les autres doctrines des *minima naturalia*) est celle de doctrine des *minima secundum formam*. Une doctrine « intrinsèque » différente des *minima naturalia* est celle, moins radicale, selon laquelle, bien qu'il n'y ait pas de quantité minimale de matière en dessous de laquelle la forme substantielle d'une substance matérielle ne peut pas exister, il y a néanmoins une quantité

minimale de matière en dessous de laquelle la forme substantielle de la substance considérée perd le pouvoir d'effectuer l'opération (ou une opération) qui lui est propre. L'expression adoptée dans la thèse pour désigner cette seconde doctrine « intrinsèque » des *minima naturalia* (suivant l'usage établi dans la littérature secondaire) est celui de doctrine des *minima secundum operationem*. Une troisième doctrine « intrinsèque » des *minima naturalia*, en apparence très proche de la précédente mais en fait nettement distincte d'elle, est celle selon laquelle en dessous d'un certain seuil de petitesse la forme substantielle d'une substance matérielle (homogène), bien qu'elle possède encore le pouvoir d'effectuer l'opération (toute opération) qui lui est propre, n'est cependant pas en mesure d'obtenir l'effet qui découle d'une telle opération. Dans la thèse, nous avons fait référence à cette doctrine en utilisant l'expression (adoptée par les commentateurs eux-mêmes qui présentent cette position) de doctrine des *minima secundum actionem*. Enfin, un cas limite entre les doctrines « intrinsèques » et « extrinsèques » des *minima naturalia* est celui constitué par la doctrine selon laquelle, en dessous d'un certain seuil de petitesse, les sens externes sont incapables de percevoir la substance elle-même et donc sa forme substantielle. Cependant, cette doctrine précise que cette impossibilité ne dépend pas d'une limite *a parte immutantis*, donc d'une limite attribuable à la forme substantielle de la substance elle-même, qui, par les formes accidentelles de ses qualités sensibles, agit en direction des sens externes même dans portions de matière trop petites pour être perceptibles. La limite dont dépend « l'imperceptibilité » de ces portions de substance dépend plutôt d'une limite *a parte immutatis*, c'est-à-dire d'une limite de la part des puissances sensorielles elles-mêmes, qui ne sont pas capables de recevoir les sensations produites par l'action des qualités sensibles (et, indirectement, de leurs formes substantielles correspondantes) de portions de matière extrêmement petites. Cette doctrine, qui, comme on peut le voir clairement, est principalement une doctrine des *minima sensibilia*, et seulement de manière dérivée une doctrine des *minima naturalia*, est la doctrine à laquelle on se réfère dans la thèse (suivant l'usage qui prévaut dans la littérature secondaire) avec l'expression de doctrine des *minima secundum sensum*.

Outre aux doctrines « intrinsèques » des *minima naturalia*, comme mentionné, l'autre catégorie fondamentale des doctrines médiévales des *minima naturalia* comprend les doctrines « extrinsèques ». Ce terme désigne les doctrines qui considèrent l'existence des *minima naturalia* dans les substances matérielles (homogènes) comme entièrement

dépendante de facteurs qui leur sont extérieurs. Plus précisément, les commentateurs qui adoptent ces doctrines estiment qu'il n'est pas possible d'identifier un seuil de petitesse en dessous duquel la structure métaphysique d'une substance subit un changement significatif si la substance elle-même est considérée isolément, sans tenir en considération le milieu dans lequel elle se trouve et, plus généralement, ses relations avec d'autres substances. Au contraire, dès lors que la substance en question est considérée comme faisant partie d'un milieu bien défini, et dès lors que l'existence d'une action corruptrice exercée par le milieu dans lequel la substance se trouve sur la substance elle-même est donc reconnue (un aspect qui, comme on le voit, bien qu'absente du texte de *Physique* I.4, occupe au contraire une place importante dans celui de *De sensu* 6), il devient possible d'identifier un seuil de petitesse en dessous duquel la forme substantielle de la substance considérée devient incapable de résister (à travers les formes accidentelles de ses qualités primaires) à l'action corruptrice du milieu. Par conséquent, en dessous de ce seuil de petitesse, selon les tenants des doctrines « extrinsèques » des *minima naturalia*, la forme substantielle d'une substance matérielle (homogène) est immédiatement corrompue par le milieu dans lequel elle se trouve et la matière de la substance considérée acquiert immédiatement la forme substantielle du milieu. Bien que tous les commentateurs médiévaux analysés dans la thèse qui adoptent une doctrine « extrinsèque » des minima naturalia acceptent cette caractérisation de la doctrine elle-même, des différences importantes apparaissent dans la manière dont le processus de corruption en question est conçu. Cela justifie donc l'usage du pluriel pour désigner un groupe de doctrines qui, de toute façon, ont toutes été indiquées, dans la thèse (à la suite de l'usage majoritaire dans la littérature secondaire), avec l'expression de doctrines des *minima secudum corruptionem*.

D'après la typologie (ou grille interprétative) qui vient d'être présentée, la doctrine de Philopon pourrait légitimement être considérée comme une doctrine ayant le rôle de précurseur de la doctrine des *minima secundum formam*.

Dans le monde islamique, cette doctrine trouva une consonance significative avec celle d'Averroès, mais pas avec celle d'Avicenne. En effet, comme l'a récemment montré Jon McGinnis, bien qu'Avicenne ait abordé le problème des *minima naturalia* dans le troisième traité de la *Physique* du *Kitāb al Shifā'*, sa position dans le traité est clairement centrée sur le rôle de l'action corruptrice exercée par le milieu dans lequel une substance

donnée est placée, et une telle doctrine peut donc légitimement être considérée une doctrine des *minima secundum corruptionem*. D'ailleurs, le chapitre dans lequel Avicenne développe cette discussion, c'est-à-dire le douzième du troisième traité de la *Physique* du *Kitāb al Shifā'*, constitue l'un des chapitres qui ne figure pas dans la traduction latine médiévale du traité (dont la circulation fut, d'ailleurs, probablement limitée).

C'est donc Averroès le penseur musulman qui exerça une influence presque décisive sur le débat latin médiéval concernant les *minima naturalia*. Sa doctrine à cet égard, récemment mise en lumière grâce aux importantes études de Ruth Glasner, ne fut pas élaborée dans le cadre du commentaire à *Physique* I.4, mais dans celui du commentaire à *Physique* VII.1. En particulier, dans le *Grand commentaire* (celui parmi les commentaires d'Averroès dans lequel la doctrine est formulée de la manière la plus explicite) à *Physique* VII.1 Averroès, s'interrogeant sur l'existence d'une première partie dans le mouvement, note que toutes les substances matérielles (en particulier celles homogènes ; l'exemple d'Averroès est celui du feu) possèdent une dimension minimale de matière en dessous de laquelle leur forme substantielle ne peut pas exister en elles. Averroès propose donc, dans des termes tout aussi explicites (sinon plus explicites) que ceux de Philopon, une doctrine complète des *minima secundum formam*.

Cette doctrine eut un vaste écho au Moyen Age latin. En effet, elle représentait l'une des positions (mais non celle majoritaire) adoptées dans la première phase de la réception de la philosophie de la nature aristotélicienne à Oxford vers le milieu du XIII^{e} siècle, comme le montre le fait qu'elle figure explicitement chez Adam de Buckfield (vers 1220-1279/92), en particulier dans sa *Quaestio de augmento*. De plus, cette position acquit une importance beaucoup plus significative dans le débat de la seconde moitié du XIII^{e} siècle. A cette époque, en effet, elle fut défendue avec beaucoup de vigueur par Thomas d'Aquin dans son commentaire sur la *Physique* et aussi par Pierre d'Auvergne (ca. 1240/50-1304), certainement dans un de ses *Quodlibeta* mais aussi dans le commentaire sur la *Physique* publiée en 1941 par Philippe Delhaye sous le nom de Siger de Brabant (ca. 1240-ca. 1281/84) et, selon toute vraisemblance, à attribuer (au moins pour la partie relative, entre autres, au Livre I de la *Physique*) à Pierre d'Auvergne lui-même. Dans la formulation donnée par le Pseudo-Siger, en particulier, le seuil de petitesse en dessous duquel la forme substantielle d'une substance matérielle ne peut subsister s'identifie au seuil de petitesse en dessous duquel la forme substantielle elle-même ne

possède plus une *virtus conservans* suffisante pour garantir son existence. La doctrine des *minima secundum formam* (qui, d'ailleurs, continua à circuler également dans le contexte oxonien jusqu'à au moins la fin du XIII^{e} siècle, comme en témoigne le cas du commentaire sur la *Physique* de Thomas Wylton (*fl*. ca. 1288 -1327)), cependant, engendra une forte opposition, à la Faculté des Arts de Paris, déjà dans les premières décennies de la seconde moitié du XIII^{e} siècle. Cette doctrine, en particulier, fut violemment attaquée par Boèce de Dacie (*magister artium* à Paris dans les années '60 et '70 du XIII^{e} siècle) dans son commentaire à la *Physique*, à partir de deux arguments étroitement liés entre eux.

Tout d'abord, Boèce nota que la doctrine des *minima secundum formam* supposait qu'une substance (ou plus précisément une partie d'une substance) pouvait être corrompue sans l'intervention d'un agent causal extérieur doté de qualités premières contraires à celles de la substance elle-même, contrairement à un principe fondamental de la philosophie aristotélicienne de la nature. Par ailleurs, Boèce remarqua également que la doctrine des *minima secundum formam* présupposait aussi la possibilité de la corruption d'une substance (ou plus précisément d'une partie d'une substance) sans la génération d'une autre substance, contrairement à un autre principe fondamental de la philosophie de la nature aristotélicienne. D'autres critiques des doctrines « intrinsèques » des *minima naturalia*, adressées cependant principalement à la doctrine des *minima secundum formam,* furent formulées par Jean Duns Scot dans le deuxième livre de l'*Ordinatio*, précisément dans le contexte de la discussion déjà mentionnée concernant la continuité et la divisibilité infinie en puissance engendrée par le problème du mouvement des anges. La véhémence et la force des critiques de Boèce et de Duns Scot furent de nature è rendre la doctrine des *minima secundum formam* une position minoritaire dans le débat sur les *minima naturalia* au XIV^{e} siècle.

La doctrine des *minima secundum operationem* a connu des événements très différents au Moyen Âge latin. En fait, elle s'avéra très populaire dès la première phase de la réception de la philosophie de la nature aristotélicienne, à tel point qu'elle fut adoptée à la fois dans un commentaire anonyme à la *Physique* datant du milieu du XIII^{e} siècle et publié à tort sous le nom de Roger Bacon (1214/20-1292), les *Quaestiones supra libros quatuor Physicorum Aristotelis*, et dans le commentaire au *De generatione* écrit dans les mêmes années par Albert le Grand. La position d'Albert est, à cet égard, singulière (bien

que, comme on le verra plus loin, elle trouve un parallèle très étroit avec la position adoptée par Albert concernant les *minima sensibilia* dans son commentaire au *De sensu*). En fait, Albert lie étroitement la notion aristotélicienne de *minimum naturale* à celle démocritéenne d'atome (probablement à partir de la centralité de la position démocritéenne comme objectif polémique aristotélicien dans le texte du *De generatione*, comme déjà mentionné). Dans la perspective d'Albert, Démocrite a identifié à tort comme atomes indivisibles ceux qui en réalité ne sont que de simples *minima naturalia secundum operationem* d'une substance matérielle (homogène), parfaitement divisibles en parties plus petites dotées de la même composition hylémorphique, mais pas du pouvoir d'effectuer leur opération propre. Albert va jusqu'à reconnaître à ces *minima* un rôle constitutif des substances matérielles (homogènes) elles-mêmes (du point de vue, cependant, de la simple *compositio quantitativa*, et non de la plus fondamentale *compositio essentialis*, comme le rappelle Alberto lui-même). La doctrine des *minima naturalia secundum operationem* a cependant tendance à disparaître à partir de la deuxième moitié du XIII^{e} siècle (bien que certains commentateurs, notamment oxoniens, y aient encore recours en plein XIV^{e} siècle – par exemple Guillaume d'Ockham lui-même (ca. 1287-1347) dans ses *Quaestiones* sur la *Physique*). Un sort similaire subit également la doctrine des *minima secundum actionem*, adoptée avec force entre la fin des années '50 et le début des années '60 du XIII^{e} siècle à Oxford par Geoffroy d'Aspall (*ob*. 1287) dans son commentaire à *Physique* I.4, mais vite devenue plus marginale.

Remarquablement, les raisons de la chute en disgrâce tant de la doctrine des *minima secundum operationem* que de celle des *minima secundum actionem* semblent être liées, dans une large mesure, précisément au texte du *De sensu* 6. Cela est particulièrement le cas avec la doctrine des *minima secundum actionem*. En effet, Aspall en particulier, en formulant la doctrine des *minima secundum actionem*, s'était explicitement référé à la distinction entre ce qui est sensible *virtute* et ce qui est sensible *actione* dans la *translatio vetus* du *De sensu* 6. Avec ce couple de termes l'anonyme l'auteur de la traduction visait évidemment à rendre le contraste aristotélicien entre ce qui est perceptible en puissance et ce qui est perceptible en acte, et cela fut bien compris par les commentateurs qui utilisèrent la *vetus* (d'Adam de Buckfield à Albert le Grand). Cependant, l'utilisation de ce couple de termes stimula la réflexion d'Aspall (comme celle d'autres commentateurs oxoniens de la même période), l'incitant à développer une

doctrine selon laquelle la forme substantielle d'une substance matérielle (homogène) est toujours capable de réaliser une action sur le milieu dans lequel elle se trouve, à la fois pour assimiler ce qui l'entoure et pour se diriger vers sa place naturelle, mais elle n'est pas toujours en mesure d'obtenir l'effet naturel de cette action. Pour utiliser la terminologie adoptée par Aspall, la forme substantielle d'une substance matérielle (homogène) est toujours capable d'accomplir une *actio inclinans*, mais pas (lorsqu'elle est présente en portions inférieures à un seuil de petitesse donné) une *actio inclinans et consequens effectum*.

Ce fut le Pseudo-Siger déjà mentionné (très probablement, comme il a été dit, Pierre d'Auvergne) qui souligna, se servant, entre autres choses, de la *translatio nova* du *De sensu*, rédigée par Guillaume de Moerbeke (ca. 1215-ca. 1286), que l'intention d'Aristote dans *De sensu* 6, 445b3-446a20, n'était certes pas celle de distinguer entre les entités capables d'accomplir une simple *actio inclinans* et les entités capables d'accomplir *une actio inclinans et consequens effectum*, mais celle de souligner la différence entre ce qui est capable d'accomplir une action en acte et ce qui ne possède que la puissance de l'exécuter. De plus, étendant sa critique non seulement aux *minima secundum actionem*, mais aussi aux *minima secundum operationem* eux-mêmes, le Pseudo-Siger souligna qu'une entité qui n'a pas le pouvoir d'effectuer son opération propre perd inévitablement aussi sa propre essence. Remarquablement, le Pseudo-Siger appuya cet argument sur l'autorité d'Averroès, en particulier sur celle d'un argument analogue formulé par Averroès dans le *Grand commentaire* à *Métaphysique* Θ.3. C'est un aspect qu'il convient de souligner, car cet argument, avec un autre parallèle tiré du *Grand commentaire* à *Métaphysique* H, aurait été au centre du débat sur les *minima sensibilia* à la Faculté des Arts de Paris entre la fin du XIII^{e} siècle et le début du XIV^{e}, comme on le verra bientôt. En tout cas, au-delà même des critiques formulées par le Pseudo-Siger, Boèce de Dacie lui-même critiqua les doctrines des *minima secundum operationem* et des *minima secundum actionem* notant qu'une portion d'une substance matérielle (homogène, et en particulier élémentaire), si petite soit-elle, ne perd jamais le pouvoir de se mouvoir vers sa place naturelle et d'y parvenir, à moins qu'elle ne rencontre l'opposition exercée par une autre substance, selon un autre principe fondamental de la philosophie de la nature aristotélicienne. Enfin, comme nous l'avons déjà mentionné, Duns Scot lui-même dans l'*Ordinatio* dirigea ses critiques non seulement contre la doctrine des *minima secundum*

formam, mais aussi contre les doctrines des *minima secundum operationem* et des *minima secundum actionem*. C'est certainement le résultat combiné de ces critiques qui détermina, dans une large mesure, le déclin non seulement des doctrines des *minima secundum formam*, mais aussi de celles des *minima secundum operationem* et des *minima secundum actionem*.

Cependant, il faut rappeler qu'une réflexion sur le fait qu'une forme (substantielle, mais aussi accidentelle) doit pouvoir accomplir son opération propre pour exister dans un composé hylémorphique fut clairement engagée à la Faculté des Arts de Paris entre la fin du XIII^{e} siècle et le début du XIV^{e}. Cette réflexion, qui jouera un rôle très important dans le débat latin médiéval sur les *minima sensibilia*, comme on le verra bientôt, trouve une correspondance à la fois dans le commentaire à la *Physique* de Raoûl le Breton (ca. 1270-1320/21) et dans celui de Jean de Jandun (ca. 1285-1328). Il est très difficile de déterminer quelle fut l'origine de cet important débat métaphysique, qui impliquait certainement un grand nombre de *magistri artium* actifs à Paris dans la période comprise entre (au moins) environ 1290 et environ 1310. Ce que l'on peut affirmer avec certitude, c'est que la position adoptée tant par Raoûl le Breton que par Jandun semble constituer une doctrine « intrinsèque » des *minima naturalia* selon laquelle, étant donné qu'une forme (substantielle, dans ce cas) possède le pouvoir d'accomplir l'opération qui lui est propre (dans le cas de la forme substantielle d'une substance homogène, notamment celle d'agir sur le milieu environnant pour l'assimiler à elle-même) est une condition nécessaire à l'existence de cette forme, et étant donné que la possession du pouvoir d'effectuer cette opération nécessite d'une certaine quantité de matière, en dessous de cette quantité, ne pouvant retenir le pouvoir d'effectuer l'opération qui lui est propre, la forme substantielle considérée est inévitablement corrompue. Évidemment, étant donné que la forme substantielle d'une substance homogène ne peut agir sur le milieu extérieur que par les formes accidentelles de ses qualités primaires, la puissance à laquelle se réfère la doctrine est d'abord celle des formes accidentelles des qualités primaires, dans la mesure où ils agissent comme causes instrumentales de la forme substantielle de la substance dans laquelle elles inhèrent. La doctrine « intrinsèque » des *minima naturalia* adoptée par Raoûl le Breton et par Jandun est donc une doctrine certainement plus radicale que la doctrine des *minima secundum operationem* (et *a fortiori* celle des *minima secundum actionem*), qui admet sereinement qu'une forme peut exister sans posséder le pouvoir

d'effectuer l'opération qui lui est propre. En même temps, la doctrine adoptée par Raoûl le Breton et par Jandun est légèrement moins radicale que la doctrine des *minima secundum formam*, étant donné qu'elle relève avant tout d'une considération des conditions d'existence des pouvoirs des formes, et non de celles des formes elles-mêmes, et étant donné aussi que cette considération concerne d'abord les conditions d'existence des pouvoirs des qualités primaires comme causes instrumentales des formes substantielles, et non les conditions d'existence des pouvoirs des formes substantielles elles-mêmes. Comme déjà mentionné, le débat sur la relation entre l'existence des formes et la possession du pouvoir par ces formes d'effectuer leur opération propre sera également au centre de la discussion sur les *minima sensibilia* menée, entre autres, par Raoûl le Breton et par Jean de Jandun. Cependant, comme on le verra bientôt, dans ce cas, traitant des formes accidentelles des qualités sensibles, les conclusions auxquelles arriveront les deux commentateurs seront partiellement différentes de celles auxquelles ils arrivèrent à propos des formes substantielles dans leurs commentaires respectifs à la *Physique*.

Une histoire encore différente est celle qui a vécu la doctrine des *minima secundum sensum* au Moyen Âge latin. Cette doctrine fut adoptée dès le milieu du XIII^{e} siècle par Roger Bacon dans son commentaire à la *Physique* (et, comme on le verra bientôt, aussi dans son commentaire au *De sensu*), bien que cette doctrine semble déjà perceptible également dans le commentaire anonyme à la *Physique* attribuée à Richard Rufus de Cornouailles (*fl*. 1231-1256). Cette doctrine, sans avoir un vaste écho en Europe continentale, resta une option légitime et constamment présente dans le débat oxonien. Duns Scot, en fait, montre une certaine sympathie pour elle dans l'*Ordinatio*, et elle figure encore dans la *Summa logicae et philosophiae naturalis* de Jean Dumbleton (*ob*. ca. 1349) quelques décennies plus tard. Comme on le verra bientôt, en outre, cette option théorique caractérisa toujours, en parallèle, le débat oxonien sur les *minima sensibilia* tout au long du XIII^{e} siècle et aussi pendant les premières décennies du XIV^{e} siècle.

Si la doctrine des *minima secundum sensum* représentait certes une alternative séduisante pour les commentateurs oxoniens qui ne voulaient pas adopter d'autres doctrines « intrinsèques » (et plus radicales) des *minima naturalia*, à Paris les commentateurs qui ne voulaient pas adopter les doctrines « intrinsèques » des *minima naturalia* choisirent plutôt la doctrine « extrinsèque » des *minima secundum*

corruptionem. En fait, Boèce de Dacie et Jean Duns Scot soutinrent cette position, tout en soulignant qu'elle pouvait justifier seulement une notion purement « extrinsèque » de *minimum naturale* dans les substances matérielles (homogènes). Dès les premières décennies du XIV[e] siècle, la doctrine des *minima naturalia secundum corruptionem* devint ainsi la doctrine presque universellement acceptée par les commentateurs actifs à la Faculté des Arts de Paris (et pas seulement). Pourtant, comme déjà anticipé, la doctrine elle-même subit de profonds changements à cette époque. En particulier, Walter Burley (ca. 1275-1344) d'un côté et Jean Buridan, Nicole Oresme (ca. 1320-1382) et Albert de Saxe (ca. 1316-1390) de l'autre, bien que partant de prémisses théoriques différentes, s'opposèrent à la conception traditionnelle selon laquelle les processus de corruption des substances matérielles (et de portions de celles-ci) se produisent instantanément. En particulier, ils adoptèrent une conception temporellement étendue des processus de corruption (et de changement substantiel tout court), c'est-à-dire une conception selon laquelle le changement substantiel d'une substance matérielle (au moins d'une substance matérielle homogène), ainsi que celui de n'importe quelle partie d'elle avec une extension tridimensionnelle, a lieu à travers un intervalle de temps avec une extension non nulle. Dans le cas de Walter Burley, cette conception dérivait de la théorie, adoptée dans le soi-disant *Tractatus primus* et restée ensuite présente, selon toute évidence, dans le dernier commentaire à la *Physique*, selon laquelle un accident est capable de produire, par lui-même, un changement substantiel, et selon laquelle, par conséquent, la corruption d'une substance (ou d'une partie d'elle) est la limite inclusive de son processus d'altération. Selon cette conception, bien que la corruption proprement dite (et donc le changement substantiel) reste instantanée, le processus de corruption (et donc de changement substantiel) incluant l'altération précédente est temporellement étendu. Dans le cas, en revanche, de Jean Buridan, de Nicole Oresme et d'Albert de Saxe, la conception temporellement étendue du changement substantiel s'affirma à partir de l'idée selon laquelle toutes les formes substantielles (sauf l'âme rationnelle) sont des entités dotées d'une extension quantitative dont les parties sont colocalisées avec les parties de la matière informée par la forme elle-même. Partant de cette conception, ces commentateurs tirent l'idée que le processus de corruption d'une substance matérielle (à tout le moins d'une substance homogène, mais, au moins pour Albert de Saxe, également d'une substance hétérogène, en dehors d'un être humain), ainsi comme celui de chacune de ses

parties dotées d'une extension tridimensionnelle, est un processus qui se produit sur un intervalle de temps étendu, celui nécessaire pour corrompre, d'abord, les parties les plus externes de la substance elle-même (ou d'une partie d'elle dotée d'une extension tridimensionnelle) et par la suite les plus internes.

Une conséquence inévitable de la conception temporellement étendue du changement substantiel des substances matérielles homogènes (ainsi que de leurs portions douées d'extension tridimensionnelle), tant dans la version adoptée par Burley que dans celle adoptée par Buridan, Oresme et Albert de Saxe, est que la notion de *minimum naturale secundum corruptionem* perd son sens. En effet, si la corruption d'une portion extrêmement petite d'une substance matérielle (homogène) se produit sur un intervalle de temps étendu, même une partie infiniment petite de cette portion (et donc de sa forme substantielle) vient à l'existence au moins pour un instant de temps, selon la divisibilité infinie en puissance de l'intervalle de temps étendu à travers lequel se produit la corruption elle-même. En ce sens, la seule notion de *minimum naturale secundum corruptionem* (et de *minimum naturale* tout court) que des commentateurs comme Burley, Buridan, Oresme et Albert de Saxe peuvent admettre est la notion de la quantité minimale de matière dans laquelle la forme substantielle d'une portion donnée d'une substance matérielle (homogène) est capable de résister à l'action corruptrice exercée par le milieu dans lequel elle se trouve, une quantité (définie *minimum circonstantionatum* par Burley et *minimum resistendo contra corruptionem* par Oresme) qui d'ailleurs, comme noté par ces commentateurs, dépend aussi de l'intensité de l'action du milieu lui-même.

La disparition d'une notion théoriquement "forte" de *minimum naturale* dans le débat parisien sur les *minima naturalia* pendant les décennies centrales du XIV^{e} siècle est certainement un résultat surprenant de l'enquête menée dans le deuxième chapitre de la thèse, résultat encore plus surprenant si l'on considère qu'au XVI^{e} siècle la notion de *minimum naturale* fut utilisée par des penseurs comme Jules César Scaliger (1484-1558) pour créer ce que Christoph Lüthy a récemment appelé un « corpuscularisme aristotélicien ». Comment explique-t-on qu'une notion qui, au cours du XIV^{e} siècle, avait perdu une bonne partie de son poids théorique ait pu être utilisée pour identifier les composantes essentielles d'une vision « corpuscullariste » du monde deux siècles plus tard ? La solution à cette épineuse question qui a été suggérée dans la conclusion du deuxième chapitre de la thèse consiste à constater que l'expression de *minimum naturale* fut adoptée,

au cours du XIV^{e} siècle, par des penseurs atomistes comme Nicolas d'Autrécourt (ca. 1295/98-1369) et Jean Wyclif (vers 1330-1384) pour indiquer certains des composants « primaires » des corps naturels. Une intuition qu'il semble donc important d'explorer, pour répondre à la question, est celle selon laquelle le XIV^{e} siècle vit une bifurcation dans l'usage de la notion de *minimum naturale* entre les commentaires aristotéliciens et les travaux de penseurs atomistes comme Autrécourt et Wyclif. Dans cette perspective, on pourrait donc suggérer que des penseurs postérieurs comme Scaliger utilisèrent la notion de *minimum naturale* en la reprenant de la tradition atomiste plutôt que de la discussion menée dans les commentaires aristotéliciens précédents.

Au-delà de cet aspect tout à fait marginal de la recherche menée dans la présente thèse, il importe de souligner que la reconstitution du débat ancien et médiéval sur les *minima naturalia* menée dans le deuxième chapitre, ainsi que l'investigation menée dans le premier chapitre à propos de la notion de continuité et surtout de divisibilité infinie en puissance, a permis, au cours des troisième et quatrième chapitres, de configurer de manière plus précise et correcte la reconstruction du débat ancien et médiéval sur les *minima sensibilia*, en particulier du débat latin médiéval compris entre environ 1250 et environ 1350, qui représente le centre de l'enquête menée dans cette thèse.

En outre, il faut le souligner, le deuxième chapitre de la thèse a aussi montré l'importance du texte de *De sensu* 6, 445b3-446a20 pour le débat latin médiéval sur les *minima naturalia*, un aspect qui n'a pas été reconnu dans la littérature secondaire sur les *minima naturalia* (John Murdoch va jusqu'à l'extrême de nier explicitement un rôle au texte de *De sensu* 6, 445b3-446a20 dans le débat latin sur les *minima naturalia*).

Chapitres 3 et 4 – Le débat latin médiéval sur le problème des *minima sensibilia* (ca. 1250-ca. 1350)

Si, comme déjà mentionné plus haut, la croyance à la divisibilité infinie en puissance des grandeurs (ainsi que du mouvement et du temps) était largement acceptée dans les mêmes termes par tous les commentateurs latins médiévaux, comme nous venons de le voir les positions qu'ils adoptèrent à l'égard du thème des *minima naturalia* étaient au contraire profondément diversifiées. La reconstruction de la physionomie du débat latin médiéval sur les *minima naturalia* permet donc de commencer à esquisser une première physionomie du débat latin médiéval sur les *minima sensibilia*. Tout d'abord, la doctrine des *minima naturalia secundum formam*, du moins dans sa version la plus pure, s'étend nécessairement aussi au débat sur les *minima sensibilia*, car elle présuppose que la forme substantielle de toute substance matérielle détermine la quantité minimale de matière dans laquelle une telle forme substantielle peut exister. D'autre part, si on admet le principe aristotélicien déjà mentionné selon lequel les accidents ne peuvent exister sans leur propre *subiectum*, on doit considérer que la quantité minimale de matière dans laquelle une forme substantielle donnée peut exister est aussi la quantité minimale de matière dans laquelle les formes accidentelles de ses qualités sensibles peuvent exister. De plus, comme déjà souligné, la doctrine des *minima secundum sensum* représente non seulement une doctrine des *minima naturalia* mais aussi, et plus encore, une doctrine des *minima sensibilia*, car l'action exercée par une substance matérielle sur les sens externes dépend directement des formes accidentelles des qualités sensibles qui lui sont inhérentes. Enfin, la considération du processus de corruption d'une substance matérielle donnée (ou d'une partie d'elle) comme temporellement étendu a inévitablement pour conséquence non seulement de nier l'existence d'un *minimum naturale secundum corruptionem* pour cette substance, mais aussi de tout *minimum sensible secundum corruptionem*. En fait, tout comme la forme substantielle, même les formes accidentelles des qualités sensibles associées à des parties extrêmement petites de la matière viendront à l'existence au moins pour un instant dans l'intervalle de temps étendu requis par le processus de corruption du tout auquel elles appartiennent, en vertu de la divisibilité infinie en puissance de cet intervalle de temps étendu.

Cela dit, il ne faut pas oublier que le débat latin médiéval sur les *minima sensibilia* présente des spécificités importantes par rapport au débat correspondant sur les *minima naturalia*. La principale consiste dans un aspect épistémologique important (qui, cependant, a aussi des implications ontologiques significatives). Un principe fondamental de la théorie aristotélicienne de la perception, en effet, est celui selon lequel une qualité sensible se définit sur la base de sa capacité à agir sur le sens externe correspondant de manière à produire une sensation, de sorte que, si elle n'était pas capable de le faire, une telle qualité sensible existerait en vain. Remarquablement, ce principe apparaît explicitement au début de la discussion aristotélicienne sur les *minima sensibilia* dans *De sensu* 6, 445b3-446a20. Comme mentionné ci-dessus, en fait, ce principe fonde le principal argument aristotélicien contre l'idée que les qualités sensibles sont divisibles à l'infini par la division de la matière à laquelle elles sont associées. En effet, si les qualités sensibles étaient divisibles à l'infini par la division de la matière à laquelle elles sont associées, elles pourraient exister associées à des si petites portions de matière qu'elles ne pourraient pas être perçues. De plus, comme mentionné ci-dessus, la solution aristotélicienne à l'aporie des *minima sensibilia* repose exactement sur l'idée qu'aucune portion de matière ne pourrait réellement exister en acte par elle-même sans être perceptible en acte. Toute portion de matière en dessous (ou peut-être même légèrement au-dessus) du seuil de perceptibilité serait en effet corrompue par l'action du milieu dans lequel elle se trouve, perdant, outre sa forme substantielle, aussi les formes accidentelles de ses qualités sensibles. Ce modèle conceptuel garantit que le monde naturel extérieur reste toujours pleinement perceptible par les sens externes. En d'autres termes, dans la perspective aristotélicienne, aucune qualité sensible associée à une portion de matière existant en acte par elle-même ne peut échapper à la possibilité d'être perçue, en présence de conditions extérieures appropriées. Cet important principe aristotélicien a été désigné dans la thèse comme celui de la « co-extension du monde sensible et du monde perceptible ». Précisément la discussion et la problématisation de ce principe, et donc, corrélativement, du principe selon lequel une qualité sensible se définit à partir de sa capacité à agir sur le sens externe correspondant pour produire une sensation, représente l'élément le plus original et spécifique du débat latin médiéval sur les *minima sensibilia*, même par rapport au débat correspondant sur les *minima naturalia*.

D'ailleurs, la discussion à cet égard fut en un certain sens initiée par Aristote lui-même dans le passage obscur qui conclut la discussion des *minima sensibilia*. En particulier, comme mentionné, dans *De sensu* 6, 446a10-15 Aristote considère ce qui se passerait en l'absence de l'action corruptrice du milieu, et, dans ce cadre contrefactuel, il arrive à admettre la possibilité de l'existence de qualités sensibles associées à des portions de matière existant en acte par elles-mêmes qui ne sont pas perceptibles en acte. La notion de qualités sensibles « imperceptibles » se retrouve ainsi au centre du débat sur les *minima sensibilia* mené par les commentateurs du *De sensu* déjà à partir du seul commentaire au *De sensu* de l'Antiquité tardive qui atteint le Moyen Âge latin (le seul commentaire au *De sensu* de l'Antiquité tardive qui a été conservé, plus généralement), c'est-à-dire celui par Alexandre d'Aphrodise (*fl*. ca. 200 ap. J.-C.). C'est en effet Alexandre qui développa l'obscur passage aristotélicien du *De sensu* 6, 446a10-15 dans le sens d'une conception globale, qui dans la thèse a été définie comme « corpusculariste », selon laquelle, en l'absence de l'action corruptrice du milieu, non seulement des qualités sensibles associées à des portions de matière existant en acte par elles-mêmes trop petites pour être perceptibles en acte pourraient exister, mais, selon le troisième sens de perceptible en puissance distingué par Aristote, de telles qualités sensibles pourraient devenir perceptibles en acte en s'unissant avec une quantité suffisante de matière dotée des mêmes qualités sensibles. L'influence du commentaire d'Alexandre au Moyen Âge latin à cet égard – il faut le souligner dès maintenant – fut rendue encore plus significative par le fait que le seul commentaire au *De sensu* issu du monde islamique à avoir atteint le Moyen Âge latin, c'est-à-dire l'*Épitomé* aux *Parva naturalia* d'Averroès, n'accorde aucune attention particulière au thème des *minima sensibilia* et, par conséquent, pas même à la notion de qualités sensibles « imperceptibles » en acte.

Cependant, pour apprécier pleinement la portée de cette discussion, et ses développements au Moyen Âge latin, il a fallu, dans la thèse, tout d'abord reconstruire de manière complète les principales positions adoptées dans le débat latin sur les *minima sensibilia*.

Pour cela, nous avons tout d'abord voulu fournir une typologie (ou grille interprétative) des positions présentes dans le débat. Évidemment, il n'était pas possible de procéder à cet égard selon la même méthode utilisée dans le cas des *minima naturalia*. En effet, comme déjà amplement souligné, alors qu'Aristote n'a jamais présenté une

doctrine complète des *minima naturalia*, dans le texte de *De sensu* 6, 445b3-446a20 il est au contraire possible de reconnaître la présence d'une doctrine bien définie des *minima sensibilia*. La doctrine présentée par Aristote peut, selon la grille interprétative déjà adoptée à propos des *minima naturalia*, être caractérisée principalement comme une doctrine « extrinsèque » des *minima sensibilia*, c'est-à-dire comme une doctrine des *minima (sensibilia) secundum corruptionem*. En effet, dans la discussion d'Aristote, c'est seulement l'action corruptrice du milieu qui détermine la quantité minimale de matière dans laquelle les qualités sensibles peuvent exister.

Suivant la solution aristotélicienne, tous les commentateurs médiévaux discutés dans la thèse (à l'exception peut-être d'Albert le Grand) ont accepté une doctrine des *minima sensibilia secundum corruptionem*. Cependant, la caractérisation précise de cette doctrine dépendait d'un certain nombre de facteurs très différents. Tout d'abord, comme déjà mentionné à propos du débat sur les *minima naturalia*, un critère important de différenciation fut représenté par la façon dont la temporalité de l'action corruptrice du milieu était appréhendée, c'est-à-dire comme instantanée ou étendue. Un autre critère important de différenciation à cet égard fut représenté par le choix de considérer le seuil de perceptibilité des qualités sensibles comme inférieur (ou à la limite égal) ou supérieur à celui de leur corruptibilité (évidemment cet aspect s'est avéré central dans le débat sur les qualités sensibles « imperceptibles », comme on le verra bientôt). Enfin, un troisième critère de différenciation des commentateurs médiévaux à propos de la doctrine des *minima sensibilia secundum corruptionem* concerna la reconnaissance ou non d'un rôle causal à l'action du milieu dans la corruption des qualités sensibles elles-mêmes (tous les commentateurs analysés dans la thèse, d'ailleurs, à l'exception de Thomas d'Aquin, en analogie avec le commentaire à la *Physique* du Pseudo-Siger, ont reconnu ce rôle).

Au-delà de ce débat, cependant, le texte aristotélicien de *De sensu* 6, 446a10-15, permit aux commentateurs médiévaux, tout en acceptant une doctrine des *minima sensibilia secundum corruptionem*, de spéculer sur ce qui se passerait en l'absence de l'action corruptrice du milieu lui-même, et donc de réfléchir à la possibilité d'identifier des limites « intrinsèques » à la divisibilité des qualités sensibles à travers la division de la matière à laquelle elles sont associées. En effet, en l'absence du milieu, comme mentionné, Aristote reconnaît explicitement une limite à la capacité des qualités sensibles à être perçues par les sens externes correspondants. La réflexion sur l'existence de *minima*

sensibilia « intrinsèques », en particulier, se développa à partir de la traduction latine du commentaire au *De sensu* d'Alexandre d'Aphrodise par Guillaume de Moerbeke en 1260, étant donné que, comme déjà souligné, le passage aristotélicien de *De sensu* 6, 446a10-15, a fait l'objet d'une attention particulière de la part d'Alexandre. Tous les commentateurs analysés dans la thèse, suivant l'autorité aristotélicienne (et alexandrine), à l'exception (une nouvelle fois) de Thomas d'Aquin, ont adhéré à l'idée selon laquelle, au moins dans un monde possible dépourvu de l'action corruptrice du milieu, il y aurait des portions de matière minimales existant en acte par elles-mêmes dont les qualités sensibles pourraient être perçues en acte. Les qualités sensibles associées aux portions de matière inférieures à ce seuil seraient donc « imperceptibles » en acte. Cependant, la manière dont cette « imperceptibilité » était conçue par les commentateurs varia également de manière très significative.

Certains commentateurs adoptèrent la position selon laquelle les qualités sensibles « imperceptibles » en acte ne possèdent pas le pouvoir d'effectuer leur opération propre d'agir sur les sens externes (se rapprochant ainsi d'une position qui pourrait être définie, selon les catégories déjà adoptées pour les *minima naturalia*, une doctrine des *minima sensibilia secundum operationem*). D'autres commentateurs, au contraire, soutenaient que non seulement les qualités sensibles « imperceptibles » en acte possèdent en tout cas le pouvoir d'agir sur les sens externes, mais, de plus, qu'elles sont toujours « actives », de sorte que les limites à leur perceptibilité dépendent exclusivement des pouvoirs des sens externes (selon la doctrine déjà définie des *minima secundum sensum*).

D'autres commentateurs adoptèrent plutôt une doctrine « intrinsèque » des *minima sensibilia* substantiellement analogue à celle des *minima naturalia secundum formam*, soutenant que, tout comme les formes substantielles, les formes accidentelles des qualités sensibles déterminent également, au moins en l'absence de la action corruptrice du milieu, la quantité (maximale et) minimale de matière dans laquelle elles peuvent exister. Cette doctrine a été identifiée, dans la thèse, avec le nom de doctrine des *minima sensibilia secundum formam*, par analogie avec la doctrine correspondante concernant les *minima naturalia*.

Évidemment, cette typologie ne peut pas épuiser la richesse des nuances des positions adoptées par les commentateurs latins médiévaux analysés dans la thèse à propos des *minima sensibilia*, mais elle fournit un tableau d'ensemble important qui a

structuré l'analyse menée dans le troisième et dans le quatrième chapitre de la thèse (le troisième chapitre de la thèse portait sur le débat latin médiéval relatif à la période ca. 1250-ca. 1300, tandis que le quatrième chapitre portait sur le débat latin médiéval relatif à la période ca. 1300-ca. 1350). Maintenant, nous allons résumer les principaux résultats de ces chapitres, en suivant le même ordre d'exposition adopté dans le cas des *minima naturalia*.

Sans doute, la position la plus radicale parmi les commentateurs latins qui ont adopté les doctrines « intrinsèques » des *minima sensibilia* est celle représentée par Thomas d'Aquin. Comme déjà mentionné plus haut, en effet, Thomas, tirant les conséquences de sa propre doctrine des *minima naturalia secundum formam*, affirma fermement, dans son commentaire au *De sensu*, que, si les formes substantielles des substances matérielles (homogènes) déterminent la quantité (maximale et) minimale de matière dans laquelle elles peuvent exister, par conséquent cette quantité minimale de matière représente aussi la quantité minimale de matière dans laquelle les formes accidentelles des qualités sensibles des substances elles-mêmes peuvent exister, à moins qu'on choisisse de nier le principe aristotélicien fondamental selon lequel les accidents ne peuvent pas exister sans leur propre *subiectum*. Cependant, devant faire face à la claire affirmation aristotélicienne du *De sensu* 6 selon laquelle la corruption des qualités sensibles associées à des portions de matière extrêmement petites qui existent en acte par elles-mêmes est causée par l'action corruptrice du milieu, Thomas précise que, en divisant la quantité de matière qui constitue le *minimum naturale* (et le *minimum sensibile*) de toute substance matérielle, elle perd sa forme substantielle et les formes accidentelles de ses qualités sensibles et acquiert la forme substantielle et les qualités sensibles du milieu, mais, et ceci est crucial, non pas à cause de l'action corruptrice du milieu lui-même, mais à cause de la faiblesse de son propre pouvoir de conservation. En ce sens, Thomas, comme déjà mentionné, est le seul commentateur médiéval parmi ceux analysés dans la thèse (avec le Pseudo-Siger dans son commentaire à la *Physique*) à croire que l'action du milieu ne constitue pas la cause de la corruption des qualités sensibles associées à des portions de matière extrêmement petites qui existent en acte par elles-mêmes.

Dans le deuxième chapitre, il a été souligné que Pierre d'Auvergne partage la doctrine des *minima naturalia secundum formam*. Or, dans le cadre de son commentaire au *De sensu*, Pierre d'Auvergne, contrairement à Thomas, reconnaît le rôle causal de

l'action corruptrice du milieu dans la corruption des qualités sensibles associées à des portions de matière extrêmement petites qui existent en acte par elles-mêmes. Néanmoins, dans le cas d'un scénario contrefactuel dépourvu de l'action corruptrice du milieu, Pierre d'Auvergne reconnaît que les formes accidentelles des qualités sensibles détermineraient la quantité (maximale et) minimale de matière dans laquelle elles peuvent exister, de sorte que les formes accidentelles elles-mêmes seraient immédiatement corrompues (du fait de la faiblesse de leur pouvoir de conservation) en portions de matière inférieures à cette quantité. En ce sens, remarquablement, la doctrine des *minima secundum formam* adoptée par Pierre d'Auvergne dans le débat sur les *minima sensibilia* ne repose pas, comme chez Thomas, sur une simple extension de la doctrine des *minima naturalia secundum formam*, mais, au contraire, elle constitue une doctrine complète et autonome des *minima sensibilia secundum formam*, c'est-à-dire une doctrine qui peut être formulée indépendamment de la référence aux formes substantielles des substances matérielles considérées. Remarquablement, ni Thomas ni Pierre d'Auvergne n'admettent (ni dans la réalité ni dans un scénario contrefactuel) l'existence de qualités sensibles « imperceptibles » en acte qui existent par elles-mêmes. Selon eux, en d'autres termes, la quantité minimale de matière dans laquelle les formes accidentelles de qualités sensibles peuvent exister est une quantité de matière suffisante pour permettre à ces formes accidentelles d'agir sur les sens externes de manière à produire des sensations.

Des doctrines « intrinsèques » des *minima sensibilia* moins radicales que celles de Thomas et de Pierre d'Auvergne, comme on l'a dit, sont les doctrines qui soutiennent que, du moins dans un monde possible sans l'action corruptrice du milieu, bien que les formes accidentelles des qualités sensibles soient infiniment divisibles en puissance à travers la division de la matière à laquelle elles sont associées, leur pouvoir d'effectuer l'opération d'agir sur les sens externes de manière à produire des sensations ne l'est pas. En d'autres termes, ces doctrines admettent l'existence, au moins dans un monde possible sans l'action corruptrice du milieu, de qualités sensibles « imperceptibles » en acte. Au sein de ces doctrines, comme mentionné, il est possible d'identifier une ligne de faille fondamentale. D'une part, la position dominante parmi les commentateurs actifs à la Faculté des Arts de Paris (surtout Raoûl le Breton, les deux auteurs anonymes des commentaires contemporains contenus dans le ms. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 2170 et dans le ms. Città del Vaticano, Biblioteca

Apostolica Vaticana, Vat. Lat. 3061, Jean de Jandun et l'auteur anonyme du commentaire conservé dans le ms. Paris, Bibliothèque nationale de France, Lat. 16160) consiste à soutenir que les qualités sensibles « imperceptibles » en acte ne possèdent pas le pouvoir d'effectuer leur opération propre d'agir sur les sens externes de manière à produire des sensations. Cette position pourrait donc, comme mentionné, être considérée comme une doctrine des *minima sensibilia secundum operationem*. D'autre part, la position dominante parmi les commentateurs actifs à Oxford (notamment Roger Bacon, l'auteur anonyme du commentaire conservé dans le ms. Oxford, Merton College, 276 et l'auteur anonyme du commentaire conservé dans le ms. Oxford, Oriel College, 33 ; la situation est différente à Cambridge, comme le montre le commentaire anonyme préservé dans le ms. Cambridge, Gonville and Caius College, 512 (543), qui pourrait, peut-être, être attribué à Jean Felmingham) est celle selon laquelle les qualités sensibles « imperceptibles » en acte non seulement conservent le pouvoir d'agir sur les sens externes de manière à produire des sensations, mais aussi restent toujours « actives » vis-à-vis des sens externes eux-mêmes. L'impossibilité de les percevoir devrait donc, selon ces commentateurs, être entièrement attribuée aux limitations des pouvoirs sensoriels des sens externes. Cette doctrine est clairement identifiable comme la doctrine des *minima secundum sensum*, déjà analysée dans le deuxième chapitre.

Au-delà des perspectives adoptées concernant les *minima sensibilia* « intrinsèques », tous les commentateurs médiévaux analysés dans le troisième et dans le quatrième chapitre de la thèse, à l'exception d'Albert le Grand, acceptent l'aspect essentiel de la solution aristotélicienne à l'aporie des *minima sensibilia* selon lequel des qualités sensibles associées à des portions extrêmement petites de matière existant en acte par elles-mêmes seraient corrompues par l'action du milieu dans lequel elles se trouvent. En d'autres termes, tous les commentateurs médiévaux analysés, hormis Albert le Grand, acceptent une doctrine des *minima sensibilia secundum corruptionem*. Cependant, comme mentionné, certains des commentateurs analysés dans la thèse nient le caractère instantané de ce processus de corruption, vidant de sens non seulement la notion de *minima naturalia secundum corruptionem*, comme déjà illustré ci-dessus, mais aussi, corrélativement, celle de *minima sensibilia secundum corruptionem*. Cependant – il faut le souligner – l'idée que le processus de corruption de portions extrêmement petites de substances matérielles (homogènes) qui existent en acte par elles-mêmes par le milieu se

déroule sur un intervalle de temps étendu fut partagée non seulement par les commentateurs déjà étudiés à cet égard dans le deuxième chapitre dont (au moins) un commentaire au *De sensu* a été conservé (Walter Burley et Jean Buridan). D'autres commentateurs, comme Raoûl le Breton et les auteurs anonymes des deux commentaires produits, comme celui de Raoûl, à la Faculté des Arts de Paris entre la fin du XIII^{e} et le début du XIV^{e} siècle (ceux conservés dans le ms. Vat. Lat. 2170 et dans le ms. Vat. Lat. 3061), suggérèrent la même idée quelques décennies avant Burley et Buridan, sans toutefois, malheureusement, détailler leur conception.

D'autres commentateurs, comme nous l'avons déjà dit, tout en acceptant la doctrine des *minima sensibilia secundum corruptionem*, et indépendamment de la considération de la structure temporelle du processus de corruption des qualités sensibles associées à des portions de matière extrêmement petites existant en acte par elles-mêmes, mirent en discussion le présupposé aristotélicien fondamental selon lequel le seuil de perception des qualités sensibles est inférieur (ou à la limite égal) à celui de leur corruptibilité. Parmi les commentateurs qui adoptèrent cette position, le nom de Jean de Jandun ressort principalement, mais la même idée était partagée par Walter Burley, par Jean Buridan et par l'auteur anonyme d'un commentaire du milieu du XIV^{e} siècle attribué à la fois à Nicole Oresme et à Albert de Saxe.

L'aspect fondamental de la position de tous les commentateurs qui soutinrent soit l'extension temporelle du processus de corruption des qualités sensibles associées à des quantités de matière extrêmement petites existant en acte par elles-mêmes, soit l'idée que le seuil de perceptibilité des qualités sensibles est supérieur à ce de leur corruptibilité (liste à laquelle il convient d'ajouter la position d'Albert, qui, comme on l'a dit, mène sa discussion sans tenir compte de l'action corruptrice du milieu), est la négation de la validité du principe aristotélicien de la « co-extension du monde sensible et du monde perceptible ». Autrement dit, selon ces commentateurs l'existence de qualités sensibles « imperceptibles » en acte n'est pas seulement une possibilité liée à un scénario contrefactuel, mais, bien plus concrètement, une caractéristique du monde naturel extérieur.

Pour bien comprendre la centralité de cet aspect pour tout le débat latin médiéval sur les *minima sensibilia*, et aussi, plus généralement, pour la conception latine médiévale de l'ontologie et de l'épistémologie des qualités sensibles, il convient maintenant de

retracer les résultats obtenus par l'investigation menée dans le troisième et dans le quatrième chapitre de la thèse par rapport au thème de l'existence de qualités sensibles « imperceptibles » en acte, indépendamment de sa considération comme simple possibilité conceptuelle ou comme caractéristique factuelle du monde naturel extérieur.

Le problème de l'existence de qualités sensibles « imperceptibles » en acte unies à des portions de matière existant en acte par elles-mêmes figure déjà de manière significative dans le commentaire au *De sensu* de Roger Bacon, datable du début des années '50 du XIII^{e} siècle et donc de la période où, selon toute probabilité, Bacon avait fait retour à Oxford. Dans ce commentaire, Bacon admet clairement que, du moins dans un monde dépourvu de l'action corruptrice du milieu, de telles qualités sensibles « imperceptibles » en acte existeraient certainement. Cependant, note Bacon, répondant à une objection qui fera écho dans le débat latin médiéval sur les *minima sensibilia*, de telles qualités sensibles n'existeraient pas en vain, étant donné que, bien qu'incapables d'agir sur les sens externes de manière à produire des sensations, elles auraient encore pour but de délimiter le monde naturel (considéré comme coétendu au monde sensible) du monde intelligible.

Le thème de l'existence en acte de qualités sensibles « imperceptibles » est également central dans le commentaire au *De sensu* d'Albert, qui peut être daté presque dans la même période. Comme mentionné, Albert mène toute sa discussion sur *minima sensibilia* sans même mentionner le rôle du milieu (un scénario qui n'a pas d'équivalent parmi les commentateurs analysés dans cette thèse). Albert reconnaît donc explicitement que l'existence en acte par elles-mêmes de portions de matière trop petites pour être perceptibles en acte est une caractéristique du monde naturel extérieur. De plus, en comparaison explicite avec l'atomisme démocritéen (attitude déjà soulignée dans le cas du commentaire d'Albert au *De generatione*), Albert appelle ces portions de matière *ultima minima* des substances matérielles (puisque dotées d'une « extension minimale » de matière et donc, en un certain sens, constituant les composants quantitatifs ultimes des substances matérielles qui peuvent exister en acte par eux-mêmes). Cependant, Albert affirme clairement que les *ultima minima* des substances matérielles ne possèdent pas les formes accidentelles de leurs qualités sensibles, mais exclusivement leurs *inchoationes*. Recourant ainsi à un concept typique de sa propre métaphysique et philosophie de la nature, utilisé cependant de manière originale dans ce contexte, Albert illustre selon un

modèle « corpusculariste » la formation et la structure des qualités sensibles perceptibles en acte. En effet, dans sa reconstruction (une reconstruction qui peut ainsi être placée en antagonisme direct avec l'explication de la nature des qualités sensibles donnée par Démocrite), les qualités sensibles perceptibles en acte sont le résultat de l'union d'un certain nombre d'*ultima minima* doués des *inchoationes* de telles qualités sensibles.

Le débat sur l'existence de qualités sensibles « imperceptibles » en acte devint, si possible, encore plus houleux après 1260, lorsque Guillaume de Moerbeke traduisit le commentaire au *De sensu* d'Alexandre d'Aphrodise. Thomas d'Aquin fut le premier à reconnaître le « danger » d'affirmer, comme le fait Alexandre dans son commentaire, qu'en l'absence de l'action corruptrice du milieu, des qualités sensibles « imperceptibles » en acte auraient pu aisément exister. En d'autres termes, Thomas nie catégoriquement même la possibilité conceptuelle de l'existence de telles qualités sensibles, déclarant qu'une puissance sensorielle capable de la percevoir doit nécessairement correspondre à chaque qualité sensible. Une position largement analogue fut ensuite adoptée par Pierre d'Auvergne, comme déjà mentionné.

Cependant, déjà vers la fin du XIII^{e} siècle, et surtout au début du XIV^{e}, l'existence en acte par elles-mêmes de qualités sensibles qui ne sont pas perceptibles en acte commença à être communément admise non seulement dans le cas d'un monde dépourvu de l'action corruptrice du milieu, mais aussi dans le monde naturel extérieur réellement existant.

Bien que ce développement trouve des antécédents proches chez Raoûl le Breton et chez les deux auteurs des commentaires anonymes conservés dans le ms. Vat. Lat. 2170 et dans le ms. Vat. Lat. 3061 (et un antécédent plus loin, dans une certaine mesure, chez Albert le Grand), l'architecte fondamental de ce développement est Jean de Jandun. La centralité de la position de Jandun dans le débat latin médiéval sur les *minima sensibilia* dépend, en fait, précisément du fait qu'il a explicitement thématisé et discuté en détail, bien plus que tout autre commentateur latin connu, non seulement la possibilité de l'existence, tant dans un scénario contrefactuel que dans le monde naturel extérieur, des qualités sensibles « imperceptibles » en acte, mais aussi et surtout les problèmes théoriques associés à une telle idée.

Le problème essentiel sur lequel Jandun se concentre concerne la possibilité pour une entité formelle donnée, dans ce cas les formes accidentelles des qualités sensibles,

d'exister sans posséder le pouvoir d'effectuer son opération propre (selon la notion de *minima sensibilia secundum operationem* qui prévaut dans le contexte parisien), dans ce cas celle d'agir sur les sens externes de manière à produire des sensations. Il s'agit évidemment d'un problème qui ne tient pas exclusivement aux formes accidentelles des qualités sensibles, et ce n'est pas pour rien que, comme on l'a vu, autour de ce problème s'articulent aussi bien la discussion sur les *minima naturalia* de Jandun lui-même que celle de Raoûl le Breton. Jandun fonde sa discussion sur l'argument, déjà évoqué plus haut, tiré du *Grand commentaire* d'Averroès à *Métaphysique* Θ.3, selon lequel une entité sans le pouvoir d'effectuer son opération propre perdrait *ipso facto* son essence. L'argument d'Averroès, initialement destiné à contester la doctrine typique de l'occasionalisme islamique selon laquelle le seul agent causal dans le monde est Dieu lui-même, est ainsi utilisé par Jandun dans un contexte très éloigné de celui auquel il était initialement destiné. Pour répondre adéquatement à cet argument, sans toutefois renoncer à la possibilité de concevoir des qualités sensibles « imperceptibles » en acte, Jandun va jusqu'à soutenir que, pour qu'une entité formelle ne perde pas son essence, il suffit que, même s'elle ne possède pas le pouvoir d'effectuer l'opération qui lui est propre, elle possède la disposition à acquérir ce pouvoir dès lors que certaines conditions particulières de nature contingente sont satisfaites. Autrement dit, dans le cas particulier des formes accidentelles des qualités sensibles, Jandun énonce que, pour qu'une entité donnée soit définie comme la forme accidentelle d'une qualité sensible, il suffit qu'elle possède la disposition à acquérir le pouvoir d'agir sur le sens externe correspondant de manière à produire une sensation une fois qu'elle est présente dans une quantité suffisante de matière. En outre, Jandun soutient que, en tout cas, les qualités sensibles peuvent être définies comme telles, même lorsqu'elles ne possèdent pas le pouvoir d'agir sur les sens externes de manière à produire des sensations, pour le simple fait qu'elles nous permettent de délimiter le monde naturel extérieur du monde mathématique et donc du monde intelligible (la proximité avec l'observation analogue de Bacon est vraiment significative). Jandun affirme d'ailleurs que les qualités sensibles « imperceptibles » en acte douées de la simple disposition à acquérir le pouvoir d'agir sur les sens externes de manière à produire des sensations représentent les composants ultimes des qualités sensibles perceptibles en acte. La comparaison directe de son modèle conceptuel avec celui de

Démocrite montre clairement que Jandun, comme Albert avant lui, est pleinement conscient des implications « corpuscularistes » de sa position.

De plus, comme déjà souligné, Jandun n'entend pas son modèle conceptuel comme une simple réflexion sur ce qui se passerait dans un monde dépourvu de l'action corruptrice exercée par le milieu sur des portions extrêmement petites des substances matérielles existant en acte par elles-mêmes et sur leurs qualités sensibles. Au contraire, se basant sur l'hypothèse que le seuil de perceptibilité des qualités sensibles est supérieur à celui de leur corruptibilité, Jandun prétend que l'existence de qualités sensibles « imperceptibles » en acte est une caractéristique incontournable (et permanente) du monde naturel extérieur. En d'autres termes, selon Jandun, il existe une gamme bien définie de dimensions de substances matérielles (ou de portions d'elles) à l'intérieur de laquelle les qualités sensibles peuvent exister en acte par elles-mêmes sans être perceptibles en acte. Pour reprendre la terminologie adoptée par Jandun, ces qualités sensibles (et les portions de matière auxquelles elles sont associées) sont *insensibiles*, mais non *insensibiles omnibus modis*, dans la mesure où elles peuvent devenir perceptibles en acte en s'unissant à une quantité suffisante de matière doté des mêmes qualités sensibles.

La caractérisation par Jandun des qualités sensibles en termes dispositionnels, principalement non relationnels et « corpuscularistes », ainsi que son application directe au monde naturel extérieur, exerça une influence décisive sur le débat contemporain et immédiatement postérieur concernant les *minima sensibilia*, à Paris et pas seulement.

Chez les contemporains, un traitement largement analogue à celui proposé par Jandun (mais limité à un scénario contrefactuel dépourvu de l'action du milieu) est présent dans le commentaire anonyme conservé dans le ms. Paris, BnF Lat. 16160 (dans ce cas, cependant, il est presque impossible de déterminer la relation chronologique précise avec le commentaire de Jandun). En outre, un traitement du thème des *minima sensibilia* probablement postérieur (bien que légèrement) à celui de Jandun et influencé par une position analogue à celle adoptée par Jandun lui-même est le traitement contenu dans le commentaire anonyme du ms. Oriel 33. L'auteur de ce commentaire, tout en interprétant les qualités sensibles « imperceptibles » en acte comme toujours « actives », selon une position typique du débat oxonien sur les *minima sensibilia*, et tout en reconnaissant que l'existence de telles qualités sensibles « imperceptibles » en acte est admissible exclusivement dans un scénario contrefactuel dépourvu de l'action du milieu, suit

largement la voie tracée par Jandun, reconnaissant que, pour qu'une qualité sensible soit définie comme telle, il suffit qu'elle soit perceptible en acte une fois unie à une quantité suffisante de matière douée des mêmes qualités sensibles. Par ailleurs, l'auteur de ce commentaire se réfère (ainsi que l'auteur du commentaire du ms. Paris BnF Lat. 16160) à l'argument déjà mentionné tiré du *Grand commentaire* d'Averroès à *Métaphysique* Θ.3 et, remarquablement, le met en rapport à un argument largement analogue (mais de nature proprement épistémologique) tiré du *Grand commentaire* d'Averroès à *Métaphysique* H, mais lu évidemment à travers la médiation des *Auctoritates Aristotelis*, selon lequel, de même que le changement substantiel permet de connaître la matière première, la réalisation de l'opération qui lui est propre permet de connaître la forme (substantielle ou accidentelle).

La référence significative au *Grand commentaire* d'Averroès à la *Métaphysique*, dans une phase cruciale du débat latin médiéval sur les *minima sensibilia*, est un aspect qui mérite d'être souligné. En fait, comme déjà mentionné, l'*Épitomé* aux *Parva naturalia* composé par Averroès ne contient même pas une allusion au problème des *minima sensibilia*. Cependant, cela n'a pas rendu l'influence d'Averroès sur le débat latin à propos des *minima sensibilia* moins significative. En effet, à l'influence exercée à travers la discussion de la doctrine des *minima (naturalia) secundum formam* (une doctrine des *minima naturalia*, rappelons-le, fortement redevable au *Grand commentaire* d'Averroès à la *Physique*), s'ajoute l'influence exercée par Averroès à travers les deux arguments précités tirés du *Grand commentaire* à la *Métaphysique*.

Cela dit, reprenant le fil de la discussion, il faut souligner une fois de plus que l'influence de la doctrine des *minima sensibilia* de Jean de Jandun s'avéra essentielle dans l'acceptation, par les commentateurs qui lui succédèrent (contrairement, on l'a vu, à ceux à peu près contemporains), de l'existence de qualités sensibles « imperceptibles » en acte dans le monde naturel extérieur. L'idée, en effet, sur laquelle Jandun fonda sa conviction, à savoir celle selon laquelle le seuil de perceptibilité des qualités sensibles est supérieur à celui de leur corruptibilité, fut partagée, à partir d'un certain moment, par Walter Burley (dont les commentaires au *De sensu* sont dans un rapport chronologique complexe avec celui de Jandun), par Jean Buridan, et par l'auteur anonyme d'un commentaire au *De sensu* attribué à la fois à Nicole Oresme et à Albert de Saxe et presque certainement produit à

la Faculté des Arts de Paris vers le milieu du XIV^{e} siècle (plus probablement dans les premières décennies de la seconde moitié du siècle).

Dans le cas de Burley et Buridan, comme mentionné, cette conviction fut également renforcée par l'acceptation d'une conception temporellement étendue du processus de corruption de portions extrêmement petites de matière existant en acte par elles-mêmes et des qualités sensibles qui leur sont associées. Cependant, dans la thèse il a été souligné que l'acceptation de cette dernière conception peut tout au plus fonder la croyance à l'existence de qualités sensibles « imperceptibles » en acte *pendant* ce processus de corruption lui-même, donc de qualités sensibles « imperceptibles » en acte qui, dans la thèse, ont été définies comme « éphémères ». Au contraire, l'acceptation de l'idée selon laquelle le seuil de perceptibilité des qualités sensibles est supérieur à celui de leur corruptibilité fonde la croyance à l'existence de qualités sensibles « imperceptibles » en acte « permanentes ». C'est précisément l'acceptation de l'existence, dans le monde naturel extérieur, de ce dernier type de qualités sensibles « imperceptibles » en acte et des portions de matière auxquelles elles sont associées (celles que Buridan appellera *insensibilia propter parvitatem*, et dont il reconnaîtra la nature de « composants ultimes », du point de vue quantitatif, des portions de matière perceptibles en acte), et la caractérisation de telles qualités sensibles en termes dispositionnels, principalement non-relationnels, et « corpuscularistes », la nouveauté la plus significative qui se dégage de l'analyse du débat latin médiéval sur les *minima sensibilia* de l'époque ca. 1250-ca. 1350.

Conclusions

Essayons maintenant de résumer brièvement les principaux résultats théoriques de l'étude du débat latin médiéval sur les *minima sensibilia* de la période ca. 1250-ca. 1350. À ce propos, il est certainement possible de mettre en évidence au moins trois points principaux, qui sont également utiles pour développer l'analyse dans le sens de ses répercussions chronologiquement postérieures.

Le premier point qui ressort de l'analyse du débat latin médiéval sur *les minima sensibilia* menée dans la thèse, et que nous voulons souligner en conclusion, concerne le fait qu'au cours de ce débat les qualités sensibles perdirent progressivement le caractère « actif » qui les caractérise dans la théorie de la perception et dans la philosophie de la nature aristotélicienne, acquérant un caractère plus « passif » (plus précisément dispositionnel), contribuant ainsi à saper la croyance aristotélicienne fondamentale à la capacité humaine à posséder un accès épistémologique à l'ensemble du monde naturel extérieur. Même sans vouloir suggérer aucun lien, il est remarquable de noter que l'idée de la nature dispositionnelle des qualités sensibles est un aspect qui figure explicitement (bien que dans un cadre conceptuel complètement différent) dans la théorie de la perception de certains penseurs modernes tels que Robert Boyle au XVII^{e} siècle et Thomas Reid au XVIII^{e}. Parallèlement, il faut aussi souligner que la conception « passive » (dispositionnelle, mieux) des qualités sensibles se développa parallèlement à une conception plus « active » du rôle des sens dans le processus de perception. À cet égard, cependant, une prudence particulière a été exercée dans la thèse. Si, en fait, le développement d'une théorie du *sensus agens* (par analogie avec l'*intellectus agens*) au Moyen Âge latin est fortement lié précisément au nom de Jean de Jandun, dans la théorie de Jandun les sens jouent un rôle « actif » exclusivement à l'égard des sensations déjà reçues dans les sens externes et produites par les qualités sensibles ; par conséquent, dans cette théorie le seul agent causal du processus de la sensation restent en tout cas les qualités sensibles elles-mêmes (plus précisément, celles perceptibles en acte).

Le deuxième point fondamental issu de l'analyse du débat latin médiéval sur les *minima sensibilia* concerne le fait que, à travers son développement, le monde naturel extérieur acquit une plus grande autonomie par rapport à la sphère de la sensation. Si, en effet, au début du débat latin sur les *minima sensibilia*, vers 1250, le monde naturel

extérieur était considéré comme entièrement perceptible, à la fin du parcours reconstruit dans la thèse, vers 1350, la situation avait considérablement changé. Bien sûr, il était toujours vrai que le monde naturel extérieur était considéré comme entièrement sensible (la possession de qualités sensibles était même devenue une condition nécessaire pour appartenir au monde naturel extérieur), mais il n'était plus considéré comme entièrement perceptible. Par conséquent, une prise de conscience des limites de la capacité humaine à connaître la structure ultime de la réalité naturelle commença à s'imposer.

Le troisième point fondamental qui ressort de l'analyse du débat latin médiéval sur les *minima sensibilia* consiste à souligner la conception « corpusculariste » de la structure des qualités sensibles en acte qui est adoptée d'abord par Albert le Grand, puis, de manière beaucoup plus détaillée, par Jean de Jandun, et, dans son sillage, par certains commentateurs postérieurs, notamment Jean Buridan. Dans cette conception, remarquablement, les composants ultimes (du point de vue quantitatif) des qualités sensibles perceptibles en acte ne sont pas à leur tour perceptibles en acte par eux-mêmes. Bien qu'un tel modèle, du point de vue ontologique, ne trouve pas d'équivalent direct à l'Âge classique, il est très difficile de ne pas rappeler, à cet égard (encore une fois, sans vouloir suggérer aucun lien, mais seulement une possibilité de comparaison), le rôle que les perceptions insensibles (en tant que sous-groupe des petites perceptions) jouent (exclusivement, cependant, du point de vue épistémologique) en constituant les perceptions dont on peut avoir conscience dans le cadre de la théorie de la perception développée par Leibniz, notamment, dans les *Nouveaux Essais sur l'entendement humain*.

Annexe

La thèse est complétée par un Annexe qui contient un inventaire provisoire de tous les témoins manuscrits des commentaires latins au *De sensu et sensato* datables entre le XIII^{e} et le XV^{e} siècle. La recherche qui a conduit à la rédaction de cet inventaire (établi à partir de tous les répertoires disponibles contenant des listes de témoins manuscrits des commentaires latins médiévaux sur les œuvres aristotéliciennes) était un préalable indispensable à la réalisation d'une étude doctrinale qui, comme souligné, visait à prendre en considération l'intégralité des commentaires latins au *De sensu* conservés datables certainement entre environ 1250 et environ 1350. Cependant, il a été jugé approprié d'inclure l'inventaire en annexe à la thèse car nous espèrons qu'il constituera un outil de travail précieux pour tous les chercheurs intéressés à effectuer des études concernant les commentaires latins inédits au *De sensu* dont les témoins manuscrits sont datables entre le XIII^{e} et le XV^{e} siècle (lesquels représentent, comme déjà mentionné, la grande majorité du total). Si, en fait, au moins deux répertoires concernant directement, entre autres, les témoins manuscrits des commentaires latins médiévaux au *De sensu* sont déjà disponibles, l'inventaire fourni en annexe à cette thèse en élargit et en met à jour de façon majeure les résultats. En effet, non seulement il inclut 93 commentaires au *De sensu* (en comptant soit les commentaires littérales soit les commentaires *per quaestiones*, et en comptant soit les commentaires attribués soit les commentaires anonymes) dont les témoins manuscrits peuvent être datés entre le XIII^{e} et le XV^{e} siècle, mais il inclut également au moins deux découvertes significatives.

En premier lieu, en effet, les recherches effectuées pour la préparation de l'inventaire ont permis de déterminer qu'un commentaire important datant de la fin du XIII^{e} ou du début du XIV^{e} siècle, le commentaire contenu dans le ms. Merton 276, unanimement considéré comme anonyme dans la littérature secondaire, contient le même texte également présent dans un autre témoin manuscrit, le ms. London, British Museum, Add. 18630, où cependant le commentaire est explicitement attribué à Walter Burley (bien que l'attribution reste évidemment à confirmer sur la base d'une analyse paléographique et codicologique complète du texte contenu dans le manuscrit londonien). En deuxième lieu, les recherches effectuées pour la préparation de l'inventaire ont permis d'identifier un deuxième témoin manuscrit (le ms. Leipzig, Universitätsbibliothek, 1150)

du commentaire au *De sensu* attribué à Raoûl le Breton et conservé dans le ms. Firenze, Biblioteca Nazionale Centrale, Conv. Soppr. E.I.252.

Comme déjà largement mentionné, ce ne sont que des résultats provisoires, mais extrêmement importants pour la reconstruction de l'histoire des commentaires latins médiévaux à un traité aristotélicien, le *De sensu*, dont l'importance ne peut être sous-estimée, un aspect que, nous espérons, la présente thèse a aidé à mettre en lumière.

RÉSUMÉ

La thèse porte sur l'un des sujets les moins étudiés de la philosophie de la nature aristotélicienne latine médiévale (ca. 1250-ca. 1350), à savoir le soi-disant sujet des *minima sensibilia*. Si, comme il est affirmé notamment dans *Physique* VI, les grandeurs sont infiniment divisibles en puissance, un dilemme se pose quant aux limites de divisibilité des qualités sensibles à travers la division de la matière (considérée comme une grandeur étendue) à laquelle elles sont unies. Soit les qualités sensibles sont aussi infiniment divisibles en puissance (mais cela implique que les sens doivent avoir un pouvoir infini pour les percevoir, contrairement à un présupposé aristotélicien fondamental concernant les limites de tout pouvoir existant dans la nature), soit elles ne sont pas infiniment divisibles en puissance (dans ce cas, cependant, il y aurait des portions de matière qui ne peuvent être connues ni par les sens ni, évidemment, par l'intellect, et, ce qui est pire, les entités sensibles seraient finalement composées par elles, ce qui est tout à fait inacceptable dans la vision du monde aristotélicienne). Pour résoudre le dilemme, Aristote, au chapitre 6 du *De sensu et sensato* (445b3-446a20), fait usage de la distinction entre acte et puissance, affirmant que les qualités sensibles sont infiniment divisibles en puissance en tant que parties du tout auquel elles appartiennent, mais qu'il y a des quantités minimales de matière qui peuvent exister en acte par elles-mêmes douées de leurs qualités sensibles. La thèse examine la réflexion menée par les commentateurs latins médiévaux au *De sensu et sensato* (toujours lus en relation avec leurs sources grecques et islamiques) sur le sujet des *minima sensibilia*, en l'utilisant comme une perspective privilégiée pour étudier à partir d'un point de vue nouveau et original la conception latine médiévale de l'ontologie et de l'épistémologie des qualités sensibles. En effet, à travers un examen attentif du débat (qui s'accompagne d'une reconstruction approfondie de la tradition manuscrite des commentaires latins médiévaux au *De sensu*, qui ont jusqu'à présent été largement négligés par les chercheurs), il est démontré que les commentateurs latins médiévaux développèrent progressivement une conception selon laquelle les qualités sensibles peuvent exister par elles-mêmes dans le monde naturel sans être perceptibles en acte en raison de la petitesse de la matière à laquelle elles sont unies. De telles qualités sensibles (que l'on appelle parfois *insensibilia propter parvitatem*) peuvent néanmoins devenir perceptibles en acte en s'unissant les unes aux autres. Grâce à ce développement fondamental, non seulement les qualités sensibles commencèrent à être comprises dans une large mesure indépendamment de leur rôle dans la perception, mais le monde sensible devint soudainement beaucoup plus étendu que le monde perceptible par les sens, avec pour conséquence que la confiance en la capacité humaine à connaître sa structure ultime commença à se désintégrer.

MOTS-CLÉS

Aristote, *De sensu et sensato*, qualités sensibles, divisibilité infinie en puissance, *minima sensibilia*.

ABSTRACT

The thesis focuses on one of the least studied topics in Medieval Latin Aristotelian natural philosophy (ca. 1250-ca. 1350), i.e., the so-called topic of *minima sensibilia*. If, as claimed most notably in *Physics* VI, magnitudes are (potentially) infinitely divisible, a dilemma arises with respect to the limits of the divisibility of sensible qualities through the division of the matter (considered as an extended magnitude) with which they are united. Either sensible qualities are also (potentially) infinitely divisible (but this implies that the senses should have an infinite power in order to perceive them, against a fundamental Aristotelian assumption concerning the limits of every power existing in nature), or they are not (potentially) infinitely divisible (in this case, however, there would be portions of matter that can neither be cognised by the senses nor, evidently, by the intellect, and, what is worse, sensible entities would be ultimately composed of them, something entirely unacceptable in the Aristotelian worldview). To solve the dilemma, Aristotle, in Chapter 6 of the *De sensu et sensato* (445b3-446a20), makes use of the distinction between act and potency, affirming that sensible qualities are infinitely divisible in potency as part of the whole to which they belong, but there are minimal quantities of matter that can exist in act on their own endowed with their sensible qualities. The thesis investigates the reflection conducted by Medieval Latin commentators of the *De sensu et sensato* (always read in connection with their Greek and Islamic sources) on the subject of *minima sensibilia*, using it as a privileged gateway to study from a new and original point of view the Medieval Latin conception of the ontology and of the epistemology of sensible qualities. Indeed, through a close scrutiny of the debate (which is accompanied by a thorough reconstruction of the complex manuscript tradition of Medieval Latin *De sensu* commentaries, that have hitherto been largely neglected by scholars) it is demonstrated that Medieval Latin commentators progressively developed a conception according to which sensible qualities can exist on their own in the natural world without being perceptible in act due to the smallness of the matter with which they are united. Such sensible qualities (that are sometimes called *insensibilia propter parvitatem*) can, nevertheless, become perceptible in act by uniting with each other. Thanks to this fundamental development, not only sensible qualities started to be understood mostly in autonomy from their role in perception, but the sensible world became suddenly much more extended than the world that can be perceived by the senses, with the consequence that the confidence in the human ability to cognise its ultimate structure began to crumble.

KEYWORDS

Aristotle, *De sensu et sensato*, sensible qualities, (potential) infinite divisibility, *minima sensibilia*.