

THE QUANTITY DEBATE IN LATE MEDIEVAL AND EARLY MODERN EUROPE: A
QUESTION AT THE INTERSECTION OF PHYSICS, METAPHYSICS, AND THEOLOGY

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THE QUANTITY DEBATE IN LATE MEDIEVAL AND EARLY MODERN EUROPE: A
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My dissertation aims to challenge the standard narrative in post-Kantian histories of philosophy and science about the 17th century shift from Aristotelianism to mechanism as involving a fundamental reconceptualization of continuous quantity, or extension, and material substance, and as creating a deep divide between the ‘modern’ and ‘medieval’ periods. On that view, René Descartes’ understanding of extension as the nature of material substance is seen as one of the hallmarks of that shift. I show that, in fact, (a) late medieval philosophers did not hold one uniform theory of extension but a rich, wide array of views; and (b) a deeper continuity underpins Descartes’ metaphysics and the views of (some) late medieval philosophers. To this end, I examine in detail the views of three representative 14th century thinkers: William Ockham, John Buridan, and Nicole Oresme; and the implications of their views for Descartes’ metaphysics.

For each of these authors, I aim to answer the following questions: (1) what kind of entity is extension? (2) Is extension accidental or essential to material substance, using ‘accidental’ and ‘essential’ in this sense: is extension a feature that material substances can, at least by divine power, lack? I investigate these philosophers’ arguments in connection with two phenomena, one natural and the other supernatural: (i) condensation and rarefaction (C/R); and (ii) transubstantiation (T), the Catholic interpretation of the sacrament of the Eucharist. First, on the Aristotelian understanding of C/R, when a body condenses or rarefies, only its extension changes

while everything else (prime matter, substantial form, and qualities) stays the same. Thus, C/R was considered a good test case for examining the ontological status of quantity and its relation to material substance. Second, according to T, when the priest blesses the host, the body of Christ takes the place of the bread and comes to be really present on the altar. Yet the accidents of the bread, including its extension, remain without inhering in the substance of the bread. As a result, T has far-reaching implications for the metaphysics of bodies and their accidents. Thus, my investigation interestingly brings together issues in late medieval metaphysics, physics, and theology, issues which by their very nature expose a thinker's commitments on critical questions about the nature of quantity.

Ockham, Buridan, and Oresme hold three different positions on the ontological status of quantity. Yet because of their commitment to T, they agree that a material substance can exist without extension, at least by divine power; so, extension is an accidental feature of material substances. This view is the target of severe attack by early modern thinkers, such as Descartes, for whom material substance is essentially extended. Yet my study reveals some interesting and often overlooked deeper continuities between Descartes' metaphysics and late medieval thinkers, such as Ockham's mechanistic theory of C/R and Oresme's view of accidents as modes of substance. My dissertation thus challenges and enriches our understanding of the development of the early modern notion of three-dimensional bodies and its relation to Aristotelian metaphysics.

BIOGRAPHICAL SKETCH

Francesca Bruno was born and grew up in Rome, Italy, where she started learning Latin and Greek at an early age. She moved to the United States after high school. Francesca earned a B.A. and M.A. in philosophy from the University of Houston, where she worked on Renaissance natural philosophy. Francesca obtained her Ph.D. in philosophy at Cornell University in 2019. Her research focuses on medieval and early modern (meta)physics and theology. While at Cornell, Francesca lived and worked with undergraduate students as a Graduate Resident Fellow on Cornell West Campus, in Hans Bethe House and William Keeton House. Francesca is a passionate and committed educator with over a decade of experience teaching, advising, and advocating for low-income and/or first-generation-to-college students. Francesca lives in Philadelphia, PA, with her husband Matt and their beloved Pit-bull mix Tessie.

To all my students, past and present: you have inspired, encouraged, and taught me more than
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I am deeply grateful to Helen Hattab and Bill Nelson, two of my philosophy professors at the University of Houston (UH), who believed in me and mentored me since I was an undergraduate student of philosophy at UH. They expanded my sense of what was possible for me and encouraged me to pursue a Ph.D. in philosophy. Helen has been my teacher, mentor, and friend ever since. She has profoundly shaped my work as a researcher and teacher of philosophy. Thank you, also, to her husband Jim Hattab, for his support and humor since I first met him.

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INTRODUCTION

Section I – The Debate Over Ockham’s Physics at Paris in the 1330-40s

In the mid-to-late 1330s, the spread of William Ockham (c. 1287-1347)’s teachings at the University of Paris precipitated a crisis. In 1339 the faculty of arts made a statute that prohibited the use and dissemination of Ockham’s *doctrina*.¹ As evidence of the vitriol felt by some members of the university community, consider the writings of Michael Massa and of Conrad of Megenberg in this period. Both Massa and Megenberg use the image of nausea in connection with Ockham’s physical theories.² Megenberg considers Ockham’s physics to be a “pestilence that needs thorough eradication.”³ The arts faculty prohibition against Ockham’s philosophical teachings was short-lived: it was lifted by the mid-1340s. However, the fact that a violent controversy exploded at Paris at this time is striking, considering that Ockham’s teachings were known already in the 1320s, when they were considered controversial but not (yet) “scandalous.”⁴

Courtenay (2008) suggests that the debate over Ockham’s *doctrina* turned sour because the full implications of his physics were not sufficiently apparent in the 1320s. The crucial points at issue were “his reinterpretation of the Aristotelian categories and his refusal to grant existential status to quantity, relation, motion, and time” apart from substance (and qualities).⁵ It’s worth noting that Ockham’s physical theories and his view of quantity, in particular, were the target of severe attack by thinkers who worked in the *nominalist* tradition after Ockham,

¹ The text of this statute is available in its entirety in Latin and in English translation in: William J. Courtenay, “Ockham, Ockhamists, and the English-German Nation at Paris, 1339-1341,” in *Ockham and Ockhamism: Studies in the Dissemination and Impact of His Thought* (Brill 2008), pp. 161-162.

² William J. Courtenay, *Ockham and Ockhamism: Studies in the Dissemination and Impact of His Thought* (Brill 2008), p. 271.

³ *Ibid.*

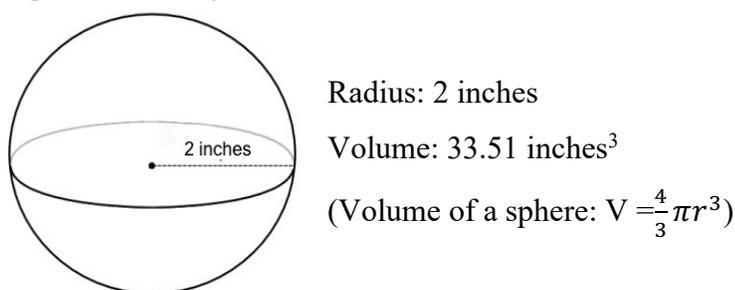
⁴ *Ibid.*

⁵ *Ibid.*

thinkers in the so-called *via moderna*, such as John Buridan (1295-1361) and Nicole Oresme (c. 1320-1382), who developed some of Ockham’s central metaphysical insights. For example, both Buridan and Oresme share Ockham’s new conception of material substance *contra* the traditional, Thomistic view (as I explain below, in section II). Yet they both reject Ockham’s reductionist view of quantity. In my dissertation I focus on the philosophical and theological motivations underpinning the realist pushback against Ockham’s reductionism about quantity, in particular. But what exactly is quantity? And what is at issue in this debate?

Within the context of this debate, **quantity** is what accounts for a material substance’s “spatial composition,” to use a term coined by Normore (2017) in connection with Buridan’s theory of material substance.⁶ That is, quantity accounts for the fact that a material substance (or a body, more generally) has really distinct parts that are spatially spread out in three dimensions. More specifically, ‘quantity’ refers to that in virtue of which a material substance is “quantified” in a particular way, namely, *as a three-dimensional object having a determinate volume*.⁷ For example, consider a ball of wax with a radius of 2 inches and a volume of 33.51 cubic inches. (See Figure 1 below)

Figure 1 – ball of wax



⁶ Calvin Normore, “Buridan on the Metaphysics of the Soul,” in *Questions on the Soul by John Buridan and Others*, edited by G. Klima (Springer 2017), pp. 63-75.

⁷ By ‘volume’ here I mean absolute rather than (merely) apparent volume. See my discussion in chapter 1 in connection with condensation and rarefaction for more details.

The quantity of the wax is that in virtue of which the wax has a volume of 33.51 inches³. Likewise, the term ‘quality’ refers to that in virtue of which a material substance is (maximally) “qualified” in a particular way, e.g. it has a certain temperature, or a certain color, etc. Suppose the wax above is yellow (like honey). Ockham and Buridan hold that the wax is this shade of yellow in virtue of some accidental form that inheres in it and makes it this color. (Oresme holds that both the particular volume and the particular color of the wax are “modes,” or ways of being, of the wax, as I explain in greater detail in Part III of this dissertation.)

English and French fourteenth-century Scholastic authors, such as Ockham, Buridan, and Oresme, seek to understand what kind of entity quantity (as defined above) is and how it is related to material substances. They couch the question in this way: is quantity some entity (*res*) in its own right really distinct from the material substance that is three-dimensionally extended? I call those who answer this question affirmatively Realists about quantity and those who answer it negatively Anti-Realists about quantity. In my dissertation, I am concerned with the views of Buridan, a realist about quantity; Ockham, an anti-realist about quantity; and Oresme whose view falls somewhere in between those of Buridan and of Ockham, and according to whom, quantity is a *mode* of substance. I focus on these three authors’ discussions of quantity in their commentaries on the *Physics*.⁸

In this introduction I proceed as follows. In Section II, I examine Ockham’s reconceptualization of quantity and material substance, both in light of the Scholastic (Thomistic) view that preceded him, and in light of the views of his Parisian followers. In Section III, I unpack the ensuing debate on quantity into four distinct (albeit related) questions.

⁸ In particular, I shall focus on: Buridan’s question-commentary on Aristotle’s *Physics* (*secundum ultimam lecturam*); Ockham’s (*expositio*) commentary on the *Physics*; and Oresme’s question-commentary on Aristotle’s *Physics* (dated before 1347).

In Section IV, I draw attention to the issues in physics, metaphysics, and theology underpinning this debate. I conclude by highlighting some key findings of my research.

Section II – Ockham & Moderni on Quantity and Material Substance

Thomas Aquinas's metaphysics of bodies is a good place to start to understand Ockham's innovations in this area. From the point of view of the Parisian fourteenth-century thinkers examined in this dissertation, Aquinas would have counted as one of the "older commentators," in contrast to Ockham.⁹ I begin by looking at their views of quantity and then briefly reconstruct their differing accounts of material substance.

Aquinas holds that continuous quantity, or extension, is the first accident of a material substance: it is the subject of all other accidents. As Adams (2010) explains, all the sensible qualities of a material substance inhere in its quantity, which in turn inheres in the substance, composed of substantial form and prime matter.¹⁰ Moreover, Aquinas "reifies" quantity: quantity can subsist on its own by miracle, in the sacrament of the Eucharist.¹¹ It's worth noting that, for Aquinas, quantity is both "what makes a body have parts" and what extends them so that they are at a distance from one another.¹²

⁹ Courtenay (2008), p. 281.

¹⁰ Marilyn McCord Adams, *Some Later Medieval Theories of the Eucharist: Thomas Aquinas, Giles of Rome, Duns Scotus, and William Ockham* (Oxford University Press 2010), p. 14.

¹¹ *Ibid.*

¹² Robert Pasnau, *Metaphysical Themes, 1274-1671* (Oxford University Press 2011), p. 260. In his (2011), Pasnau distinguishes two versions of quantity realism, which he describes as follows: "On one version of quantity realism, which I call the *A theory*, quantity is what makes a body have parts. On another version [of quantity realism], the *B theory*, quantity makes the body's parts spread out in a continuous and unified way" (p. 280). Aquinas holds both an *A theory* of quantity and a "Simple View" of matter, according to which, "prime matter is intrinsically without parts, and has parts only in virtue of being informed by quantity" (p. 280). By contrast, Pasnau explains, Scotus holds a *B theory* of quantity (p. 280). For Scotus, "prime matter of itself, intrinsically, has parts, but those parts are not spread out – extended – until prime matter is actualized by quantity" (p. 280). See Adams (2010), p. 14 as well.

By contrast, Ockham rejects these ideas. Ockham thinks that a material substance, its prime matter and substantial form, have integral composition of themselves. Quantity is what makes a material substance extended: it is what accounts for its spatial composition only (as I explained above). Most importantly, quantity is *not* a being that can exist on its own, separable from substance or quality. Thus, Ockham is an anti-realist about quantity, as I explain in greater detail in Chapter 1. Ockham also reconceptualizes material substance.

In his (2012), Lagerlund offers a helpful distinction between what he calls the “hylomorphic account of material substance,” exemplified by Aquinas and Duns Scotus, and the “mereological account of material substance,” set forth by Ockham and further developed by his followers in the nominalist tradition, such as Buridan and Oresme.¹³ According to the hylomorphic account, material substance is composed of prime matter and substantial form(s).¹⁴ In addition to prime matter and substantial form(s), a material substance is composed of integral parts, that is, for example, the roots, trunk, and branches of a tree. On this account, the substance that is composed of prime matter and substantial form is a *tertium quid*, and it is prior to its integral parts.¹⁵

By contrast, Ockham sets forth a new conception of material substance, according to which “a substance is nothing but the parts that make it up” (p. 475); and “[a]ll parts of an actual

¹³ Lagerlund, Henrik Lagerlund, “Material Substance” in *The Oxford Handbook of Medieval Philosophy*, edited by John Marenbon (Oxford UP 2012), p. 469.

¹⁴ Aquinas and Scotus disagree on the number of substantial forms that can inhere in prime matter. Aquinas holds that there “there can only be one substantial form in a single being. If this was not the case, then a substance would not be one thing (ST I, q. 73, a. 3)” (Lagerlund 2012, p. 470). By contrast, Scotus thinks that “a substance is made up of several substantial forms” (ibid.). Moreover, Aquinas and Scotus differ in their views of prime matter. Whereas Aquinas contends that prime matter is *pure potentiality* and underlies any physical change, Scotus holds that “prime matter.... exists as a positive being independent of being informed by a substantial form” (Lagerlund 2012, p. 472). However, for Scotus, “matter does not have extension prior to the inherence of some quantity” (ibid, p. 473).

¹⁵ I would like to thank Jeff Brower for pointing this out in conversation to me. Lagerlund seems to hold a different view, according to which, “Although a material substance looks as if it has parts, there are no parts that are prior to the existence of the substance, that is, it is not made out of parts” (Lagerlund 2012, p. 470).

substance are themselves actual and their actuality is not derived from the whole” (p. 475). (I discuss each of these two claims in greater detail in Chapter 1 below.) Like Aquinas and Scotus, Ockham too thinks that a material substance is composed of prime matter and substantial form(s).¹⁶ However, he does *not* think that the material substance is some *tertium quid*, distinct from the essential parts that compose it. Moreover, Ockham thinks that the integral parts of a material substance do not depend on the substance to make them actual *contra* Aquinas and Scotus. As Lagerlund explains, Ockham’s notion of material substance “ploughed the way for corpuscularianism as well as atomism” (p. 474).

The view of material substance defended by Ockham was developed further by his followers in the nominalist or the so called *via moderna* tradition, that is, by thinkers such as Buridan, Albert of Saxony, Marsilius of Inghen, and Oresme. Here I focus on the views of **Buridan and Oresme**, two nearly contemporary masters of arts belonging to a small intellectual network, comprising Albert of Saxony and Marsilius of Inghen, among others, who were “familiar with each other’s work.”¹⁷

Both Buridan and Oresme share Ockham’s mereological view of material substance, discussed above. As Arlig (2012) explains, when they say that “a whole is ‘nothing other than’ its parts taken together” they do not mean that “there is no new fact about the world when the parts are brought together”; yet, “it is a striking and substantive claim about the whole and its

¹⁶ For Ockham, matter, substantial forms, and accidental forms are individual entities of themselves (Normore 2006; Lagerlund 2012).

¹⁷ In the article “The Buridan School Reassessed. John Buridan and Albert of Saxony,” J. M. M. H. Thijssen convincingly argues that “the common notion of a Buridan school needs to be qualified” (p. 42). He suggests that we consider “John Buridan, Albert of Saxony, Nicole Oresme, Themon Judeus, and Marsilius of Inghen as a small intellectual network of nearly contemporary masters of arts, who were familiar with each other’s work and at times responded to one another” (p. 42).

parts” for they are asserting that “the whole is no new *thing* in addition to the things that are its parts” (p. 450).¹⁸ (I discuss this view in greater detail below, in Parts I and II of my dissertation.)

However, Buridan and Oresme disagree with Ockham when it comes to the metaphysics of quantity: they both reject Ockham’s view that quantity reduces to substance. Still, they hold different positions on the ontological status of quantity. Buridan holds that quantity is a so-called real accident: it is a *res* that exists in its own right, as a substance does, and which can be separated from substance by God. By contrast, Oresme thinks that quantity is a “mode” (*modus*) of substance, which exists in some lesser way than substance. As a result, it cannot be separated from substance by God. What ensues is a complex debate on quantity.

Section III – The Debate on Quantity – a closer look

Specifically, the fourteenth-century debate on quantity involves two sets of questions: (I) How is quantity related to material substance: (a) Is quantity intrinsic or extrinsic to it? (b) Is quantity accidental or essential to it? (II) What is quantity’s ontological status: (a) What kind of entity is it? (b) How does it exist? I explain each question, in turn, below.

To understand these thinkers’ theories of quantity, the first thing we need to get clear on is whether matter, and material substance more generally, *can (by divine power) exist without* being spatially extended. If so, then extension is accidental to material substances (or bodies); if not, then extension is essential to them. (Ockham and Buridan hold that extension is accidental to bodies whereas Oresme seems to think that extension is essential to them.)

¹⁸ Andrew Arlig, “Parts, Wholes and Identity,” in *The Oxford Handbook of Medieval Philosophy*, edited by John Marenbon (Oxford UP 2012), pp. 446-467.

The second question is: *in virtue of what* are bodies spatially extended? If bodies are extended *solely* in virtue of something about (or in) them, then extension is intrinsic to them. If not, and bodies are extended in virtue of something about (or in) them *and* something else, then extension is extrinsic to them. (Buridan and Oresme think that extension is intrinsic to bodies whereas Ockham holds that extension is an extrinsic property of material substances.)

Finally, the third issue is the one that features most prominently in this debate due to the way these authors phrase the question in their physics commentaries, namely, whether or not extension is some full-blown entity (a *res*), really distinct from its substance. This question too combines two separate (albeit related) ideas: (i) what kind of entity is extension, e.g. is it an accidental form (as Buridan thinks), a *modus rei* (as Oresme thinks), or something else? And (ii) *how* does this entity (whatever it is) exist? Does it exist like a substance or in some lesser way? For example, Buridan holds that quantity is a form like whiteness and heat; and he believes that such forms are *res*, that is, full-fledged beings like substances. By contrast, Oresme maintains that extension is a *modus rei* and, as such, it is not a *res* or an entity in its own right: rather, it exists in some lesser way.

This way of understanding (and unpacking) the debate on quantity allows us to draw lines between these three thinkers in fruitful and interesting ways. Focusing on question II only and describing this debate as *merely* one between Realists and Anti-realists oversimplifies the issues at hand and hides the full complexity of these philosophers' theories of material substances and extension as well as their points of agreement and disagreement.

Section IV - Philosophical and Theological Motivations Underpinning the Debate on Quantity

Now, what philosophical and theological issues are at play to answer questions I and II above?

To understand the metaphysical relation between material substance and quantity (Question I), the central problem is an issue of physics: **condensation and rarefaction (C/R)**, on the Aristotelian, Scholastic conception of this natural phenomenon. As I argue below, Buridan and Oresme reject Ockham's anti-realism about quantity for one main *philosophical* reason: that his view cannot "save all phenomena" including, in particular, C/R strictly understood (that is, as Scholastic, Aristotelian philosophers understand it).

However, when it comes to the *ontological* status of quantity (Question II), both metaphysical and theological reasons seem to be at play. One clear theological advantage of holding the view that quantity is a real accident is that it is consistent with **transubstantiation**, the Catholic interpretation of the sacrament of the Eucharist. But one philosophical problem of this view, pointed out by Oresme, is that it treats accidents, like quantity and quality, as *res* and thereby ascribes to them the same ontological status as substances. (But then, again, the view of accidents as modes has philosophical problems of its own, namely, the idea that accidents exist in some "lesser" way.)

The mereological view of material substance shared by Ockham, Buridan, and Oresme paves the way to early modern corpuscularian views such as Descartes'. But **Descartes'** view of quantity seems closer to Ockham and Oresme. Note that Descartes rejects the Scholastic understanding of C/R. This is key. For this seems to be one of the main problems with Ockham's conception of material substance and quantity.

Upshots

My dissertation reveals both the promise and the limits of the new conception of material substance ushered in by Ockham's reductionist (meta)physics. Even though Ockham's, Buridan's, and Oresme's mereological conception(s) of material substance anticipate later (17th century) corpuscularianism, they still work within an Aristotelian metaphysical framework, which limits their ability to explain natural phenomena, such as C/R, mechanistically, as Ockham tries to do. In fact, Buridan and Oresme are right to push back against Ockham's reductionist program, especially in connection with natural philosophy, including his anti-realism about quantity. For Ockham's slim metaphysics, as appealing as it may be for a modern, post-Cartesian audience, fails to satisfactorily account for the features of material objects within the Aristotelian, Scholastic constraints shared by most fourteenth-century philosophers.

This is why, too, later philosophers who defend corpuscularian and mechanistic conceptions of bodies, such as Descartes, must jettison some of the Aristotelian, Scholastic (meta)physical assumptions late medieval philosophers still accept, such as their conception of C/R. Thus, my dissertation not only helps us put into clear(er) focus the sophisticated theories of material substances and quantity these three (representative) fourteenth-century philosophers develop, with each of its components, but it also sheds lights on the physical, metaphysical, and theological assumptions they share and that are too easy to miss, for contemporary readers, whose conception of the natural world is still fundamentally shaped by modern intuitions.

PART I: OCKHAM'S ANTI-REALISM ABOUT QUANTITY

CHAPTER 1

OCKHAM ON THE VARIABILITY AND EXTRINSICALITY OF QUANTITY

My goal in this chapter is to reconstruct the theory of quantity that Ockham sets forth in his natural works.¹⁹ As I explained above, Ockham thinks that quantity is what accounts for a substance's specific three-dimensional extension, or volume. When a material substance is "quantified," its integral parts are spatially extended in such a way that the substance has a determinate (absolute) volume.²⁰ Ockham holds what I shall call an anti-realist view of quantity, according to which quantity is *not* some thing (*res*) really distinct from the material substance that's extended. To better understand what Ockham's anti-realism about quantity amounts to, in this chapter I first reconstruct his *mereological* account of material substance; second, I examine the ontology of quantity as an *extrinsic* property of material substances; finally, I analyze his *mechanistic* theory of condensation and rarefaction.

Section I: Ockham's mereological account of material substance

As Lagerlund (2012) explains, Ockham's mereological account of material substance consists of two key metaphysical theses:

1. A whole is nothing other than its parts.
2. All parts of an actual substance are themselves actual, and their actuality is not derived from the whole. (p. 475)

In what follows I shall explain each of these two claims in turn. I shall refer to claim 2 as "Mereological Actualism."

¹⁹ I will discuss the theory of quantity that Ockham sets forth in his theological works in Chapter 2 and in the Appendix.

²⁰ Quantity accounts for a material substance's "spatial composition" but not for its "integral composition," to use a terminology coined by Normore (2017).

Claim 1: A whole is Nothing but Its Parts

For Ockham, a material substance is composed of parts of two sorts. First, a material substance is composed of what he calls the “essential parts,” that is, matter and form. These are what Pasnau (2011) calls the “metaphysical parts” of a composite substance. For, he explains, “such parts can be identified not by usual empirical methods, but only by abstract, metaphysical arguments” (p. 7).²¹ Second, a material substance is composed of what he calls the “integral parts,” e.g. a tree’s roots, trunk, branches, leaves, and so on. Normore (2006) describes the integral parts of a material substance as “the parts into which it can be *physically* divided” (emphasis mine; p. 739).²² When Ockham considers if a whole is something other than its parts, he is thinking about the relationship between a material substance and its *essential* parts.²³ As Cross (1999) highlights, “the question Ockham asks is whether a composite of matter and form is more than just the sum of matter and form” (p. 143).²⁴

Ockham holds that a material substance is numerically identical with both of its essential parts, taken together.²⁵ He says so explicitly in his *Summula Philosophiae* I.19: “I say that, beyond the parts that are matter and form, there is no third entity distinct from these. So a composite is neither matter, nor form, but matter and form together, united and conjoined” (Cross transl.; OPh VI, 206, II.30-3). But how are we to understand the union of matter and form? As Cross (1999) explains, on Ockham’s view, “matter and form have a natural tendency to unite”; they unite unless prevented (p. 155). The union of matter and form just is “the lack of blocks on union; no more, no less” (Cross 1999, p. 155). Thus, a material substance is not *merely*

²¹ Robert Pasnau, *Metaphysical Themes* (Oxford UP 2011), section I.3, pp. 6-11.

²² Calvin Normore, “Ockham’s Metaphysics of Parts,” *The Journal of Philosophy* 103 (Dec 2006), pp. 737-754.

²³ See for example: Ockham, *Summula Philosophiae Naturalis* I.19; *Quaestiones variae* 6.2.

²⁴ Richard Cross, “Ockham on Part and Whole,” *Vivarium* 37 (1999), pp. 143-167.

²⁵ See Cross 1999 and Normore 2006.

an aggregate of matter and form. On Ockham's view, matter and form are such that, by their very nature, they create the appropriate sort of unity (unless impeded).²⁶ But precisely because of this, Ockham need not posit a new thing that is distinct from matter and form to account for their union.²⁷ So, Ockham thinks that the whole substance is nothing other than its essential parts.

As Arlig (2012) explains, when Ockham claims that a composite substance is nothing other than its matter and form, he is claiming that "if one considers the things present in a whole and the things present in the parts that compose the whole, there is no difference in the tally of *things* that are present. The whole possesses no *thing* that the mere aggregation of its parts lacks" (emphases mine; p. 462). But if this is the case, then what is it that makes it true that the parts actually compose a whole? Ockham believes that "no extra thing is required" (ibid.). As long as the matter exists, the form exists, and there is nothing preventing them from uniting, composition occurs.

As I mentioned above, matter and form are not the only parts into which a material substance can be analyzed. Material substances have integral parts too. In fact, material substances are bodies, and no body lacks integral parts. Ockham thinks that bodies are physical continua and, as such, they are composed of infinitely many, actually existing parts. The parts Ockham has in mind here are the spatially extended parts that can be obtained by dividing the whole and each of its parts into halves, or thirds, and so on.²⁸ For example, consider the branches, leaves, parts of leaves, and so on, of a plant. In what follows, I briefly explain in what

²⁶ See: Andrew Arlig, "Parts, Wholes and Identity," *The Oxford Handbook of Medieval Philosophy*, edited by John Marenbon (Oxford UP 2012), pp. 445-467.

²⁷ Ibid., p. 453.

²⁸ Magali Roques, "Ockham on the Parts of the Continuum," *Oxford Studies in Medieval Philosophy* 5 (August 2017), p. 185.

sense the parts of a continuum “actually exist” and in what sense they are infinitely many, according to Ockham.

Claim 2: Mereological Actualism

Ockham thinks that any continuum (including bodies) is infinitely divisible. As Murdoch (1984) explains, the division of a continuum is not one that occurs “through the real separation of the things divided” since then the continuum would no longer be a whole (p. 184). Rather, Ockham explains:

the division... naturally occurs through *an act of the mind*, in virtue of the fact that the mind *truthfully and without deception* says that ‘in this whole continuum there are two halves, and in each of these halves there are two [more halves], and each of these two subsequent halves has two halves,’ so that it never occurs that the soul takes some part in a whole continuum without being able to always, truthfully say that there are two halves of that part. (emphases mine; *Questiones Phys*, q66; OPh VI, p. 583)

Ockham concludes that it is not necessary for the infinite divisibility of the continuum that “any part can be actually divided through nature (*per naturam*) by a real division”; the fact that “any part can really be divided in the way mentioned above [e.g. by a truthful act of the mind]” suffices (ibid).²⁹ As Roques (2017) points out, “to say that a continuum can be infinitely divided is nothing more than to say that any part can be divided, the resulting parts further divided, and so on *ad infinitum*” (p 191). This is Aristotle’s concept of the potential infinite.

²⁹ “*Dico tamen quod haec est concedenda, ‘continuum potest dividi in infinitum’ ... Et hoc dico per potentiam Dei, non per naturam, propter aliquod impedimentum. Veruntamen naturaliter [fit] illa divisio lineae [per] actum animae, per hoc quod anima vere et sine mendacio dicit quod ‘in isto toto continuo sunt duae medietates, et [in] utraque illarum medietatum sunt duae, et utraque istarum secundarum medietatum habet duas medietates,’ ita quod numquam contingit animam accipere aliquam partem in toto continuo quin veraciter possit semper affirmare quod illius partis sunt duae medietates. Et hoc est quod dicit Commentator Ex qua auctoritate patet quod non oportet quod quaelibet pars continui possit actualiter per naturam dividi divisione reali, sed sufficit ad infinitatem continui quod quaelibet pars possit realiter dividi in modo praedicto.* (emphases mine; *Quaestiones In Phys* q66; OPh VI, p. 583)

However, as Roques (2017) convincingly argues, Ockham departs from Aristotle by claiming that “the parts of the continuum exist before any division of the continuum” (emphasis mine; Roques 2017, p. 181). In fact, he claims that “whether a part exists in the continuum or is separated from it, it exists properly speaking by an existence and an actuality of its own, not of the whole” (Roques transl.; Ockham, QP 69, OPh VI, p. 589, II. 10-12).

In his *Quaestiones Phys*, q. 68, Ockham asserts that “the parts of a continuum are in a continuum *actually*” in the sense that “they are in *natura rerum* and they truly really exist outside of the soul (*vere realiter existentia extra animam*)” (OPh VI, p. 588). But Ockham specifies that such parts are *not* “separated from each other in such a way that they don’t make something one *per se*” (ibid.).³⁰ Ockham is thus an actualist. He believes that all parts of a continuum are real, and by ‘real’ he doesn’t mean that they exist separately from the continuum but that they exist outside of the mind, in *natura rerum*. (Ockham’s main argument for thinking this goes as follows: (1) every part of some actually existing thing itself actually exists *in rerum natura* (OPh VI, p. 588). But (2) every continuum is some actually existing thing (ibid.). Thus, (3) every part of a continuum is something that exists “in rerum natura,” that is, some actually existing thing (ibid.).³¹)

Hence, the parts of a continuum are “already there,” before any division of the continuum, “in the sense that in the continuum the parts have *a strong ontological status*: their existence does not depend, in any sense of the term ‘depend,’ on the existence of their whole.

³⁰ This is how we are supposed to understand Aristotle’s dictum that the parts of a continuum are *potential*: they do not exist separately from the whole.

³¹ “*omnis pars actualiter existentis est vere existens actualiter in rerum natura; sed omne continuum est actualiter existens; igitur quaelibet pars sua est vere existens in rerum natura. Maior patet, tum quia nihil componitur ex isto quod non est; tum quia a toto ad partem respectu existere est bona consequentia. Et ideo bene sequitur ‘continuum est, igitur quaelibet pars continui est’*” (OPh VI, p. 588).

The process of dividing a continuum is something Ockham ascribes to our mind, but the mind only takes the already existent parts involved in this division; it does not create them” (emphasis mine; Roques 2017, p. 201). So, *contra* Murdoch (1984), Roques maintains: “Since the parts of the continuum are already there before any division, the parts of the continuum are not defined or identified by means of a division, as was the case in Aristotle. Ockham... substitute[s] for the Aristotelian idea of a process without an end the idea of a construction of the whole from the parts” (p. 209).

Ockham believes that, in any continuum, there are infinitely many actual parts.³² There seem to be two main readings of this view: a weaker reading, set forth by Murdoch in his seminal 1984 paper on this subject; and a stronger reading, defended by Pasnau in his 2011 work. On the first reading, when Ockham says that, in a continuum, there is an infinite number of actual parts, he means that “there can always be more.”³³ This is also referred to as the *syncategorematic* sense of the term ‘infinite.’ On the second reading, when Ockham says that, in any continuum, there are actually infinitely many parts he just means that: that there are *literally* infinitely many parts (Pasnau 2011, p. 61, fn 6).³⁴ This is usually referred to as the *categorematic*

³² As Murdoch (1984) explains, the fact that the parts in question are infinitely many doesn’t raise a problem for Ockham’s actualism. Murdoch argues: “Surely one would agree that the half of some actually existent whole is actually existent, so by parity of reasoning why not the half of that half, and so on with respect to any half?” (Murdoch 1984, p. 185).

³³ Murdoch 1984: “Above all, to say, with Ockham, that there is an infinity of actually existing parts is not in any way to say that there is an actual infinity of parts. Indeed, his idea of the kind of infinity these actually existent parts have is that they are not so numerous but that they can be more numerous (*non tot quin plures*) – that is, that they are potentially or syncategorematically infinite, not actually or categorematically infinite” (p. 189).

³⁴ Pasnau: “According to Murdoch, then, Ockham means ‘infinite parts’ only in the weaker syncategorematic sense (there can always be more), rather than in the stronger categorematic sense (there are, literally, infinitely many parts). Although Ockham certainly uses phrases that suggest the syncategorematic reading, this is consistent with his accepting an actual infinity of parts in the categorematic sense too, and I see no other reason to doubt that this is his view. Indeed, I do not understand what else the view could be. The parts of a continuum are real, Ockham says. How many parts are there, right now, in actual fact, infinitely many. This just is, so far as I can see, to embrace the actual infinity of parts, in the categorematic sense. Moreover, Ockham shows some signs of doubting the familiar scholastic principle that a real infinity is impossible (see, e.g. *Quod* II.5 [IX: 131]; but cf. *Quod* III.1 [IX:203]).” (Pasnau (2011), p. 612, fn. 6).

sense of ‘infinity.’ I believe Roques 2017 convincingly argues in support of Pasnau’s stronger reading.

Roques (2017) explains that before any division of the continuum, the parts are “infinitely many in the sense that no division of the continuum will exhaust all the existing parts of the continuum taken conjointly” (p. 183). They are not infinitely many in Murdoch’s weaker sense that a part can always be divided into two parts that did not exist before the division (p. 183). Roques thus supports Pasnau’s reading. As she interestingly points out, Ockham complements Aristotle’s concept of the potential infinite with “a kind of actual infinite” (Roques 2017, p. 195).³⁵

Finally, it’s worth mentioning that Ockham did not think all infinities to be equal. For example, consider a whole and any one of its parts. Both the whole and the part are infinitely divisible, according to Ockham. But then, one might ask, isn’t the part supposed to be *smaller* than the whole? One might worry that, on Ockham’s view, there is an *equal* number of parts in the whole and in any of its parts, that is, an infinite number. But Ockham does not think that all infinities are made equal, so to speak. For there is one sense of ‘greater’ by which one infinite set of items can be said to be greater than another: greater, that is, by some indefinite number.³⁶

³⁵ Pasnau (2011) describes Ockham’s “actualism” as consisting of the following three theses:

- (i) every continuous region of a continuous body actually exists as a part of that body;
- (ii) each of these parts exists in virtue of its own intrinsic actuality;
- (iii) every continuous body contains an infinite number of such parts” (p. 613)

³⁶ In his *Expositio Physicorum* Ockham explains “the greater infinity of parts in a whole continuum than in any of its parts” by drawing “a distinction about possible excesses or greater numerosities among infinities that is similar to that just cited from his *Quodlibeta*” (Murdoch; p. 173). “Thus, in both his *Expositio Physicorum* and in another quodlibetal question he claims that we can solve the paradox in this instance by once again seeing that the term *plura* (or a phrase containing it) can be taken in two senses. In one, *plura* entails being greater by some definite number (which, as in the parallel case cited above, does not apply to infinities). Alternatively, infinities can be covered by a second sense of *plura* wherein one thing contains as much or as many as another but also contains something else in addition” (ibid.).

To sum up: on Ockham's view, a material substance is composed of two kinds of parts: (i) essential parts, namely, matter and form; and (ii) integral parts, such as the roots, trunk, branches, leaves, and so on, of a tree. Following Pasnau (2011) and Normore (2006), one could think of the essential parts of a substance as its "*metaphysical*" parts; and of the integral parts of a composite substance as its "*physical*" parts. Ockham holds that a material substance is nothing other than the sum of its matter and form. Matter and form naturally unite so as to compose a material substance, but their union is not some third thing in addition to them. Moreover, a material substance is composed of infinitely many, actually existing, spatially extended (integral) parts. As I explain in the next section, a material substance has this corpuscular structure in virtue of quantity.³⁷ I turn to Ockham's theory of quantity next.

Section II: Ockham's (four-part) theory of quantity

Ockham thinks that quantity is what accounts for a material substance's spatial composition, that is, quantity accounts for the fact that a material substance (or, a body, more generally) has really distinct parts that are spatially spread out in three dimensions. He holds an anti-realist view of quantity: he thinks that quantity is *not* some thing (*res*) in addition to, and really distinct from, a material substance's matter and form. Since Ockham thinks that a material substance, as well as its matter and form, have integral parts, quantity is nothing over and above a material substance's integral parts either. In Ockham's view, a material substance has spatial composition in virtue of itself (*per se*) and some external agent, that causes the really distinct parts of substance to be at a certain distance from one another, as I shall explain below.

³⁷ Here I borrow the term "corpuscular structure" from Pasnau (2011).

It's worth noting, though, that even if this is the case, to be quantified is an accidental and variable feature of material substances for Ockham. These are two features of Ockham's account of quantity that have recently gone unnoticed or been misunderstood. For example, in his (2011), Pasnau argues that being quantified, or being spatially extended, is essential to material substances for Ockham: it is a property that material substances *cannot* lack, even by divine power.³⁸ However, as I show in the next chapter, where I focus on Ockham's theological works, Ockham believes that a material substance *can*, in fact, exist without being quantified.

Briefly, Ockham holds that, once the host is consecrated, the body of Christ comes to be located on the altar under the physical qualities of the bread. (In what follows I shall use 'bread' or 'host' as a shorthand for 'the qualities of the bread' or 'qualities of the host.')

Now, the circular place the host occupies is significantly smaller and differently shaped than the place Christ's body occupies when it is extended in normal circumstances. But by divine power, in the Eucharist, Christ's body comes to be "contained," so to speak, within the place occupied by the host. Specifically, Ockham holds that it comes to be located there *holenmerically*: as a whole in the whole host and as a whole in each part of the host, just as the human soul was thought to be in the human body. But, in Ockham's view, this implies that the body of Christ is therefore *not* quantified. Hence, it is possible for a material substance, like Christ's body, to lack quantity.

Moreover, and more importantly for my present purposes, being quantified is a variable feature of material substances for Ockham and his contemporaries. This logically follows from the Aristotelian, Scholastic understanding of condensation and rarefaction, as I shall explain in greater detail below. On this view, when a substance condenses or rarefies (C/R), one and the same substance decreases or increases in (absolute) volume, without losing or acquiring any

³⁸ Pasnau (2011), p. 289.

integral parts. Recall that, even though Ockham thinks that every substance has infinitely many, actually existing integral parts, he does allow one to compare infinities. He does believe, for example, that a whole (w) is bigger than one of its parts (p), even though they both are composed of infinitely many parts; for w is greater than p in the sense that w has as many parts as p and more, by some indefinite number. So, in the case of C/R, we can say that, when a body condenses, it doesn't have any fewer integral parts than before; and when a body rarefies, it doesn't thereby acquire more integral parts, as it would through nutrition. Nevertheless, numerically the same body comes to occupy a smaller or bigger place. This implies that a body's quantity, or its volume, is *variable*.

The variability of quantity gives rise to a (*prima facie*) problem for Ockham. Given Ockham's anti-realism about quantity, according to which, quantity is nothing (literally, no *res*) in addition to the matter and form of a material substance, what explains that a body has this volume now, and a different volume later, as a result of condensing or rarefying (C/R)? Since the matter and form of a material substance remain *constant* during the process of C/R, Ockham cannot point to a change in the essential parts of a material substance to explain the natural change in volume the substance undergoes. Yet Ockham thinks that quantity is no "extra" thing, in addition to a substance's matter and form, and their integral parts. So, what else explains the body's change in volume when it condenses or rarefies?

Ockham seems to appeal to some *extrinsic agent* to account for the fact that this body is extended a given amount now, and a different amount later. In his commentary on Aristotle's *Physics*, Ockham holds that a material substance has integral parts of itself (*per se*). But in order for such parts to be spatially extended a specific amount, and for the material substance to have a certain volume, it suffices that "some external causes make [the parts] be at a certain distance

from one another.”³⁹ For Ockham, there is no need to postulate some thing (*res*) inhering in the material substance to account for this spatial property of a material substance.⁴⁰

So, on my interpretation, Ockham’s theory of quantity comprises four theses:

1. Anti-realism: quantity is not some thing (*res*) in addition to, and really distinct from, a material substance and its essential parts.
2. Accidentality: quantity is an accidental feature of material substances. It is a feature that material substances can (by divine power) lack, as Christ’s real presence under the consecrated host shows. (See Chapter 2)
3. Variability: quantity is a variable feature of material substance. One and the same substance changes its volume while its essential parts (matter and form) remain constant.
4. Extrinsicity: a material substance has a determinate volume in virtue of two facts: (i) a substance’s having really distinct parts; and (ii) some external agent causing such parts to be at a certain distance from one another.⁴¹

It’s worth noting here that, on my interpretation, even though Ockham is an *anti-realist* about quantity in the sense that, on his view, quantity is not some “extra thing” beyond material substance, he is *not a reductionist* about quantity in the sense that quantity merely reduces to material substance. For: quantity is that in virtue of which a material substance has a determinate volume. (More specifically, quantity is that in virtue of which a material substance has parts that

³⁹ “*Similiter ad hoc quod aliqua distent situ sufficit distinctio realis eorum cum causis extrinsecis potentibus facere ea distare.*” (emphases mine; *Exp. Phys.* IV.17, OPh V, p. 182). And he repeats this same view in his *Summula*, book III: “*Nec ad hoc quod pars substantiae distat a parte requiritur nisi partes substantiae et causae extrinsecae facientes eas distare. Et per consequens ad hoc quod distent non requiritur aliqua res inhaerens eis.*” (*Summula* III.12, OPh VI, p. 193).

⁴⁰ See the passages quoted in the previous footnote.

⁴¹ By contrast, as I discuss in Chapter 3, Buridan holds that having a determinate volume is an **intrinsic** property of material substances (or bodies) and this amounts to saying that a body has a given extension solely in virtue of something about (or in) the thing, and nothing else.

are three-dimensionally extended *a determinate amount*.) But, that in virtue of which a material substance has a determinate volume, according to Ockham, is *twofold*: (i) a material substance's having really distinct parts of itself (*per se*); and (ii) some extrinsic agent. So, both "anti-realism" and "extrinsicity" are true. By contrast, speaking of reductionism is misleading, I believe.

Section III: Ockham on Quantity & C/R

In his *In Phys.* IV.17 Ockham offers three main reasons for postulating quantity as some entity (*res*) in its own right, really distinct from substance: (i) to account for the fact that a substance has really distinct parts; (ii) to account for the fact that a substance's really distinct parts are *spatially* extended; or (iii) to account for C/R (OPh VI, p. 194).⁴² Here I focus on (iii): realists hold that one and the same substance cannot change its volume without some *other* entity, e.g. an accidental form, being generated or corrupted.⁴³ By contrast, Ockham denies that. In this section, I reconstruct Ockham's C/R argument in support of his anti-realism about quantity.

First, let us take a closer look at the Scholastic understanding of C/R. It is easier to explain what this consists in by focusing on either condensation or rarefaction alone. Let us consider rarefaction. Scholastic thinkers believe that when, say, I heat up a pot of water and the water rarefies, the water's volume increases while its substance (its prime matter and substantial form) remains the same. That is, the water in the pot does not increase in substance as it would if

⁴² *Et confirmatur istud [namely, that totaliter frustra ponitur talis quantitas adveniens], quia si oportet ponere talem aliam rem distinctam realiter a substantia, [i] aut oportet ponere eam quia substantia non habet partes distinctas realiter...; [ii] aut oportet ponere eam quia substantia non potest habere partem distantem a parte situatam sine alia re adveniente sibi; [iii] aut oportet ponere eam quia substantia non potest esse aliquando maior aliquando minor sine alia re adveniente sibi. Sicut homo non potest esse aliquando calidus aliquando frigidus sine omni alia re adveniente sibi, nec potest esse aliquando minus albus aliquando magis albus sine alia re adveniente sibi....* (OPh VI, p. 194)

⁴³ Ad (i): against the realist, Ockham holds that material substances have really distinct parts in virtue of themselves (*per se*). Moreover, (ad ii) in his view what accounts for a substance's really distinct parts "being distant from one another" is simply *an external agent*, not some accidental form distinct from matter and form and inhering in substance.

I were to add a cup of water into the pot. Moreover, the fact that the same amount of stuff, so to speak, comes to occupy a bigger place is not due to the fact that the empty space between its parts has increased. For the world is a plenum on their view. Nor is the water's increase in volume due to some *other* stuff, e.g. air, coming to be between parts of water and thereby increasing the distance between them. For they wouldn't consider this to be rarefaction proper.

Contrast here an early modern conception of C/R, such as Descartes' sponge model.

Here's how Descartes explains C/R:

Rarefied bodies ... are those which have many gaps between their parts – gaps which are occupied by other bodies; and they become denser simply in virtue of the parts coming together and reducing or completely closing the gaps. In this last eventuality a body becomes so dense that it would be a contradiction to suppose that it could be made any denser. Now in this condition, *the extension of a body is no less* than when it occupies more space in virtue of the mutual separation of its parts; for whatever extension is comprised in the pores or gaps left between the parts must be attributed not to the body itself but to the various other bodies which fill the gaps. In just the same way, when we see a *sponge* filled with water or some other liquid, we do not suppose that in terms of its own individual parts it has a greater extension than when it is squeezed dry; we simply suppose that its pores are open wider, so that it spreads over a greater space. (emphasis mine; CSM I, p. 225)

A rarefied body, for Descartes, is like a sponge filled with water: a body with gaps (or pores) between its parts “filled” by some other body (or bodies). When a body condenses, its parts come closer together by squeezing out the foreign body (or parts thereof), like squeezing water out of a wet sponge. By contrast, rarefaction occurs when the body widens its gaps, so to speak, as a sponge dipped in water does. Thus, one and the same body comes to have greater or less extension by simply widening or closing the gaps between its parts, which are occupied by other bodies. The key idea here is that the *body itself*, which condenses or rarefies, does *not* change its extension: it comes to occupy a smaller or larger place simply because of some *other* body.

Therefore, C/R turns out to be a mere “change of shape” (CSM I, p. 3).

Contrary to Descartes, Scholastic authors believe that when a body condenses or rarefies:

- (i) its (absolute) volume changes;
- (ii) its substance remains the same;
- (iii) there is no vacuum between the body's parts;
- (iv) and no *other* body comes to be between the (condensing or rarefying) body's parts.

These are the assumptions Ockham and his contemporaries share and the constraints within which they have to work to explain C/R.

Given these assumptions, it might seem easier to defend a *realist* view of quantity, as Ockham himself concedes. For in C/R a body changes its volume while its substance remains the same. But if that's the case, then it seems that the substance and volume are metaphysically distinct. And one cannot get around this problem by saying, as Descartes does, that the body's volume only *seemingly* changes (while its absolute volume remains constant). For, on the Scholastic view, we cannot account for the visible change in volume by appealing to some gaps between the body's parts getting bigger or smaller.⁴⁴ So, the realist argues, when a body condenses or rarefies, it simply comes to acquire a new accidental form (e.g. a new quantity), which is really distinct from the substance in which it inheres, and which makes one and the same substance occupy a larger or smaller place. But Ockham rejects this line of argument by appealing to his famous razor.

Ockham's Razor Principle states that we ought not multiply entities without necessity (*pluralitas non sit ponenda sine necessitate*) (OPh V, p. 181). Ockham argues that, by this principle, we ought *not* postulate quantity as some *res*, really distinct from (and inhering in) material substance. For, Ockham reasons, we can "just as easily" (*aeque facilliter*) say that one

⁴⁴ Whether this is due to empty space or some other stuff entering or exiting from the body.

and the same substance, having really distinct parts, can condense and rarefy, and thereby change its volume, without losing or acquiring any accidental form (OPh V, p. 182). But if that's right, then "it is completely superfluous to postulate such an added quantity" (*totaliter frustra ponitur talis quantitas adveniens*) (OPh V, p. 181).

By appealing to his razor, Ockham aims to show that there is no explanatory advantage to realism about quantity, even when it comes to C/R. He explains, "all phenomena that can be saved in virtue of these two distinct *res* [namely, substance and quantity] can be saved in virtue of a substance having really distinct parts" (OPh V, p. 183).⁴⁵ More specifically, the fact that a substance is extended in length, breadth, and depth, and that one substance is more extended than another can be explained (*potest salvari*) "in virtue of this fact only" (*per hoc solum*): "that it [the substance] has really distinct substantial parts that do not overlap (*quae non sunt simul*); that some of these parts are less close than others; and that there is no intermediary body between them" (OPh V, p. 184). Ockham adds: "And, in this way, rarefaction and condensation is easily saved" (*ibid.*).⁴⁶ How so? Ockham sets forth his own account of C/R next.

On Ockham's mechanistic model, a substance rarefies or condenses simply because its parts become more or less distant from one another. And this is not due to the substance acquiring a new accidental form. Nor is this change due to the parts of some (other) body "exiting from some of the holes" of a substance (*ibid.*). Rather: C/R happens "in virtue of the fact that this *res* [e.g. this substance] locally moves and exists now in a bigger [or smaller] place than before" (OPh V, p. 184). So, Ockham holds that, when a substance condenses, its parts (locally) move closer to one another; when a substance rarefies, its parts (locally) move further apart. C/R

⁴⁵ "*omnia quae possunt salvari per tales duas res distinctas possunt salvari per substantiam habentem partes distinctas realiter*"

⁴⁶ "*Et per istum modum faciliter salvatur rarefactio et condensatio.*"

happens simply because of the local motion of a substance's parts.⁴⁷ I will take a closer look at this account below. But, for my purposes, here is Ockham's key claim: that we can explain C/R on his anti-realist view of quantity *just as easily as* on the realist view. Thus, by Ockham's Razor Principle, it is superfluous to postulate quantity as some entity in addition to substance, and the realist is mistaken.

Ockham's theory of C/R, a closer look

In *Summula* III.12 Ockham, following Aristotle, distinguishes the natural process of rarefaction from the growth of a living organism, in which a living body gets bigger by acquiring new parts (through nutrition). He thus describes rarefaction, which applies to both animate and inanimate things, as a different kind of "increase," that is, "increase (*augmentatio*) without the addition of substance, but only in virtue of the fact that some movable thing is now extended (*extenditur*) more than before and it is of a larger quantity" (Oph VI, p. 285). Likewise, condensation is "decrease (*diminutio*) without the removal of any part of substance" but only in virtue of the fact that some body is now extended less than before and is of a smaller quantity (*ibid.*). Thus, Ockham conceives of C/R as a change in the volume of the body itself without the acquisition or loss of any (bodily) parts. How, then, does Ockham account for the fact that some body comes to be more or less extended, and thus have a larger or smaller volume in the case of C/R?

Ockham's answer is this: "when something is increased in this way [*augmentatur sic*] or rarefies the parts of the moved thing are dilated and extended and come to be more distant

⁴⁷ Here's a representative passage from Ockham's *Summula Philosophiae Naturalis*: "*condensationem vel rarefactionem quae non est nisi partes materiae magis vel minus sibi invicem appropinquari, quod potest fieri per solum motum localem partium materiae, scilicet per dilatationem et contractionem partium materiae*" (Oph VI, p. 194).

and occupy a larger place than before” (emphasis mine; OPh VI, p. 286). Hence, he argues, through rarefaction a body “doesn’t acquire anything... except place alone and no other thing” (ibid.). Likewise, when a body condenses, its parts are “compressed” (*coartatio*), come to be closer to each other, and occupy a smaller place than before. So, again, the only thing that the (condensed) body acquires is a new (smaller) place. Ockham repeats a similar account in *Summula* I.13, where he maintains that “[Condensation or rarefaction] is nothing except the parts of matter coming more or less close to one another, which can happen through the local motion of the parts of matter alone, that is, through the dilation and compression of the parts of matter” (OPh VI, p. 194).⁴⁸

So: what seems to happen in C/R is the following: a body’s parts are either contracted or expanded, e.g. they move closer to or further away from each other, and the body comes to occupy a smaller or larger place as a result. Ockham concludes that, as a body condenses or rarefies, all that changes is a body’s place, and its place changes solely by virtue of the local motion of its parts. Ockham’s account may seem simple enough. Yet, as I show in what follows, below the apparent simplicity and economy of his theory, lie several difficulties.

The main question I have is this: how exactly do the parts of a body come to be more or less distant from each other? Recall that, on Ockham’s view, there are neither empty spaces nor parts of any *other* body in between the parts of the body that is condensed or rarefied. For example, consider the red leaf on the ground before me. Suppose that the leaf condenses so as to

⁴⁸ “...condensationem vel rarefactionem quae non est nisi partes materiae magis vel minus sibi invicem appropinquari, quod potest fieri per solum motum localem partium materiae, scilicet per dilatationem et contractionem partium materiae” (OPh VI, p. 194). Cf. Pasnau’s translation: Matter is made to have a greater or lesser quantity not through its receiving any absolute accident, but through condensation and rarefaction alone. This is nothing other than for the parts of matter to come more or less close to each other, which can happen through local motion alone with respect to those parts – that is, through the parts of matter being dilated and contracted” (Pasnau 2011, p. 303).

occupy a place half of its original volume. Ockham would argue that this happens because its parts moved closer to each other (through the action of some external efficient cause). But *how* does this happen? If there were some body, such as air, in between the leaf's parts, then one could think that the air was pushed out, thereby reducing the distance between those parts that the air separated. But Ockham rejects this explanation. For, along with his contemporaries, he doesn't think that this would count as condensation, strictly speaking. Nor does he think that the parts get closer by reducing any empty spaces between them. For the world is a plenum, on his view. So, again, how do the parts get closer? Ockham seems to think they just do, all the way down.

Here's how Pasnau explains this process in his 2011 book, *Metaphysical Themes*: “[Ockham] simply holds that the parts are able to move together because they get smaller” (p. 304). But how do they get smaller? Pasnau explains: “Ockham's *straightforward* answer is that they get smaller by their parts' moving closer together” and so it goes infinitely far down (emphasis mine; p. 304). I find Pasnau's explanation unsatisfactory, for it doesn't really explain how the parts get closer to each other. His first suggestion, that this happens because they get smaller, is promising; yet he then explains this decrease in size by appealing to parts getting closer again, one level down. But this is precisely the phenomenon we are trying to understand. So, to say that a body's parts getting closer amounts to *their parts* getting closer, and so on to infinity doesn't seem to *explain* how parts get closer to begin with, or what this really means considering the assumptions I laid out above. In what follows I shall try to do better than Pasnau by breaking down Ockham's theory in each of its main components and then seeing how they work together in C/R.

Ockham holds that, when a body rarefies or condenses, it becomes more or less extended. What accounts for this fact? Its parts expanding or contracting, that is, locally moving so as to occupy a larger or smaller place. But what is local motion for Ockham? And what is place? These two ideas are clearly and easily linked in Ockham's view. He holds that local motion simply amounts to a change of place. A body's local motion from one place to another is nothing other than one and the same body being first in one place and then in another, without mediate rest.⁴⁹ Motion is not some thing really distinct from the moving body and the places it occupies at two different (successive) times. But what is place?

Again, Ockham sets forth a reductive account of place in terms of bodies and their parts alone. Consider some body *x*. Ockham thinks that *x*'s place is nothing but the (innermost) parts of the surrounding body, *y*, that are immediately in contact with *x*'s (outermost) parts.⁵⁰ For example, consider a bird flying in air. At any given time, the place the bird occupies just is the parts of air that are spatially contiguous with the (outermost parts of the) bird.⁵¹ But what does it mean for two bodies (or their parts) to be contiguous?

In his commentary on Aristotle's *Categories*, Ockham explains place, contiguity, and distance as follows:

Therefore, the Philosopher... [means to say that] to be in a place is nothing else than a body not being distant from a place, namely, that there is nothing intermediary between the body and its place. And so 'being next to' (*propinquitatis*) implies only that between this and that there is no body. And so when one posits that this body exists and that body exists and that

⁴⁹ Ockham, *Tractatus de Successivis*: "beyond a body and a place no other thing is required; but all that is required is that a body was previously in one place, and thereafter in another place, and thus continuously, so that never in the whole time does it rest in some place. And it is patent that beyond all these, nothing, aside from permanent things, is posited... and this it is to be locally moved: first to have one place... and after to have another place without any mediate rest... and to progress thus continuously" (Shapiro transl., p. 39)

⁵⁰ For example, in *Quodlibet* I, q. 4 Ockham maintains that "a place is the innermost boundary of the containing body" (*Quodlibetal Questions*, Freddoso and Kelley, p. 24). Shapiro explains that, on Ockham's view, "place ... is not the *whole* of the containing body; but is, rather, those of its innermost parts which are contiguous with the outermost extended parts of the contained" (p. 118).

⁵¹ Cf. Shapiro 1984, p. 118, fn. 289.

they are not overlapping (*simul*), and that there is no body in between them all, then one is truly next to the other, setting aside any other *res* [that one might postulate]. In the same way, ‘distance’ implies only this body and that body, and this one’s not overlapping that one, and that there is some body in between them. And inasmuch as the intervening body is larger or smaller, the distance is greater or less, and not because of some further *res* formally existing in them. (OPh II, p. 300).⁵²

So, a body *x* is “next to” some other body *y* iff (i) *x* and *y* exist; (ii) they do not overlap; and (iii) there is no third body between them. By contrast, *x* is distant from *y* iff (i) *x* and *y* exist; (ii) they do not overlap; and (iii) there is some intermediary body between them. The *size* of this third body determines *how* distant *x* and *y* are.⁵³

Now, let’s go back to Ockham’s account of C/R. Take rarefaction. When a body rarefies, it comes to occupy a bigger place. We are now in a position to understand what Ockham means by this. To say that a body (*x*) comes to occupy a larger place amounts to saying that the body’s (outermost) parts come to be next to *more* parts of the surrounding body (*y*) than before, or so

⁵² “*Ideo non est intentio Philosophi dicere quod in locato sit aliqua res ad locum distincta realiter ab utroque, sed corpus esse in loco non est aliud quam corpus non distare a loco, hoc est quod non sit aliquod medium inter corpus et locum. Et ideo propinquitas non dicit nisi quod inter hoc et hoc non est corpus. Et hoc posito quod hoc corpus sit et illud corpus sit, et non sint simul, et posito quod non sit corpus medium inter omnia illa, tunc unum vere est propinquum alteri, omni alia re circumscripta. – Et eodem modo distantia non dicit nisi hoc corpus et illud corpus, et hoc non esse simul cum isto, et quod est aliquod corpus medium inter ista; et secundum quod corpus medium est maius vel minus, est maior vel minor distantia, non propter aliquam aliam rem existentem in eis*” (In Praed 16.2; OPh II, p. 300).

⁵³ As Pasnau rightly points out, this account of distance is problematic. He explains, “A sticking point, however, is...[the step] which attempts to go from the binary *nex to/distant from* pair to a generalized analysis of how to measure distance. This is absolutely essential to the project, since what matters about distance is not the mere fact of it, but the extent of it. The analysis in [the step above] depends entirely on the size of intervening body *c*. But how do we get that? The most obvious thought is that size can be determined simply by the repeated application of the analyses in (4) and (5). One takes the two endpoints of *c*, and asks whether they are next to or distant from each other. If they are distant, in virtue of some intervening *c'*, then we perform the same analysis again, on *c'*, and we keep going until we arrive at two points that are next to each other. The size of *c* depends on how many times we have to repeat that process. Unfortunately, this method will not work, given that bodies are infinitely divisible. For as we go from *c* to *c'* to *c''* and so on, we must be considering progressively smaller bodies. But how much of the body are we meant to take off at each step? If Ockham had atomic units, we might have a definite answer, and might conceive of a body’s size in terms of numbers of its atoms. But since Ockham recognizes no smallest unit of a body, the above method can work only if we stipulate that what is to be taken off at each step is a piece of a certain size. Yet that, of course, presupposes the notion of *size* that we are trying to analyze. What this suggests is that Ockham’s approach, if it is to yield a fully adequate theory of location, needs more than facts about co-location and lying in between. It also needs some facts about distance” (emphases mine; Pasnau 2011, p. 366).

Ockham seems to think. For example, in *Reportatio* IV, q. 9, he maintains that C/R is “nothing other than that some body, through created power, sometimes occupies a larger place, sometimes a smaller one” (OTh IV, p. 174). But then he explains this process as follows: rarity (*raritas*) is “the extension of some body’s parts and their existing in more parts of a place than before” (ibid.). Likewise, density (*densitas*) is “the same parts that previously existed in more parts of a place now existing in fewer parts of the place” (ibid.).⁵⁴ Recall that *to be in a place*, for Ockham, is *to be next to some other (surrounding) body*. Thus, to be in more (or less) parts of a place simply amounts to being next to more (or less) parts of the surrounding body.

But here one might raise a problem. How can we say that, when *x* rarefies, its parts come to be closer to *more* parts of *y* (the containing body) considering that, both before and after rarefaction, *y* has an *infinite number* of parts? In fact, consider the following questions: (1) How many parts does *x* have before rarefaction? (2) How many parts does *x* have after rarefaction? (3) How many parts does *y* have before rarefaction? (4) How many parts does *y* have after rarefaction? The answer is always the same: *infinitely many*. Thus, how can we say that, after rarefaction, *x*’s outermost parts are next to *more* parts than before?

Here Ockham’s theory of unequal infinities is helpful. For it allows us to say that, after rarefaction, the number of *y*-parts immediately in contact with *x*’s (outermost) parts is greater,

⁵⁴ In *Rep* IV, q. 9, Ockham explains C/R as follows: “*Ideo potest dici, tenendo primam opinionem de quantitate quod non sit res distincta a substantia et qualitate* [this is Ockham's view, as set forth in *Reportatio* IV, q. 6], *quod est ibi rarefactio et condensatio in illis speciebus, et hoc sine omni qualitate et quantitate absoluta de novo adveniente. Et tunc fiet per istum modum quod de denso fiat rarum per solam extensionem. Ita quod 'rarefieri' et 'condensari' nihil aliud est quam quod aliquod corpus per virtutem creatam aliquando occupat maiorem locum, aliquando minorem, sine omni absoluto de novo adveniente. Ita quod raritas nihil aliud dicit nisi extensionem partium alicuius corporis et coexistentiam pluribus partibus loci quam prius; ita quod hoc nomen 'raritas' vel conceptus significat ipsam substantiam vel qualitatem principaliter, sicut quantitas, et connotat multas alias res vel partes loci quibus partes corporis rari coexistunt et nullam aliam rem dicit. Densitas autem e converso significat eandem substantiam et qualitatem principaliter et connotat coexistentiam earundem partium quae prius coexistebant pluribus partibus loci nunc coexistere paucioribus partibus loci.*” (OTh VII, pp. 174-175).

even though not by some definite number. This fact also nicely explains why x 's place at t_2 is bigger: for it has more parts than x 's place at t_1 . But we are still left with one key piece of information missing: how does x come to occupy such a larger place; or: how do x 's parts come to be next to *more* parts than before, through rarefaction? Recall that, whereas x 's place supposedly has more parts at t_2 than at t_1 , x itself has not acquired any extra parts. So, the main problem still remains.

In fact, it gets worse. Why assume even that x 's *place* has more parts than earlier? After all, Ockham thinks that a body can come to be more or less extended without any change in the number of its parts. And a body's place is nothing other than the parts of some other (surrounding) body. All that we know is that, after rarefaction, the parts that are in touch with x have a *greater extension* (say, double the amount) than those that were in touch with x before rarefaction. But we can't make any inference about any *change* in the *number* of parts of x 's place, considering that a body can come to be more or less extended without any addition (or loss) of parts.

So here are the facts we are left with, it seems, on Ockham's account. First, through C/R, a body changes its extension, without acquiring or losing anything else. For Ockham, this amounts to a change of place only: for example, consider a cubic meter of air that rarefies so as to double its volume (to two cubic meters). Call the air, a , and the places it occupies before and after rarefaction, p_1 and p_2 , respectively. On Ockham's theory, a 's number of parts has not changed through the process: there are infinitely many parts in a before rarefaction, and there are infinitely many parts in a afterwards. Specifically, in light of Ockham's theory of unequal infinities, we can say that a 's (infinitely many) parts, after rarefaction, are *not* more than a 's parts before it. (And: it is not the case that this always holds for Ockham when comparing two

infinite sets of items.) However, through rarefaction, *a* has come to occupy a larger place than before: that is, p_1 is bigger than p_2 . But to be in a place means simply to be next to some surrounding body. Thus, to be in a *bigger* place means to be next to a body whose innermost parts are more extended (than those of the first place). But then what accounts for this fact? More parts? But how do we know this? Ockham's theory of C/R seems merely to explain the extension of one body (the contained body) in terms of another (the containing body) without spelling out *how* one body or the other comes to have a greater (or smaller) extension, to begin with.

So even at a closer look Ockham's account seems fraught with many problems and leaves many questions unanswered. Even though Ockham wants to offer a reductive account of C/R in terms of parts and local motion alone, his physics doesn't have the resources to do this and leaves the main *explanandum* unaccounted for, namely, the body's change in extension without the addition (or loss) of any of its parts (or those of some other body). Also, the kind of motion at issue seems to differ importantly from the more ordinary local motion where a body goes from one place to another but comes to occupy the same amount of space overall. Finally, facts about the different sizes of bodies seem to be left unexplained. It is precisely these kinds of difficulties that lead Buridan, who otherwise is very sympathetic to Ockham's reductionist project, to defend a realist view of quantity and a non-mechanistic theory of C/R, as I explain in Chapter 3. But before I proceed to examine Buridan's (meta)physics of bodies, I take a brief detour to complete my reconstruction of Ockham's theory of quantity, by focusing on its accidentality, as set forth in the context of Ockham's theory of the Eucharist.

CHAPTER 2

OCKHAM ON THE EUCHARIST AND THE ACCIDENTALITY OF QUANTITY

The goal of this chapter is to show that quantity is an accidental feature of material substances, in Ockham's view. In this chapter, I take issue with Pasnau (2011)'s interpretation of Ockham's theory of quantity, according to which, Ockham thinks that quantity is an essential feature of material substances.⁵⁵ As I argue below, Ockham's account of the real presence of Christ in the Eucharist clearly shows that a material substance, namely, Christ's body, can (and does) exist without quantity. Thus, quantity is accidental to bodies for Ockham (*contra* Pasnau 2011).

In this chapter, I proceed as follows: first I reconstruct Pasnau's interpretation of Ockham's view of quantity. Second, I raise a clear counterexample to Pasnau's account: Ockham on the Eucharist. Third, I return to the key textual evidence Pasnau considers in support of his view and offer an alternative and more plausible interpretation, which is consistent with my reading of Ockham. Finally, I draw attention to some easily misleading features of Ockham's account on quantity that might explain (some of) the claims Pasnau makes.

Section I - Pasnau on Ockham's account of Quantity

In his (2011), chapter 14, Pasnau examines whether quantity (or extension) is essential or accidental to bodies for late medieval thinkers (pp. 280-281). That is, he says, whether

⁵⁵ In his recent (2011) book, *Metaphysical Themes*, Pasnau argues that Ockham stands out among his contemporaries for holding the remarkably modern (and sensible) position that "corpuscular structure is intrinsic or essential to a material substance" (p. 289). For, on Pasnau's interpretation, Ockham asks: if extension were merely some accidental feature, what could possibly happen to a body without it? (p. 293). As Pasnau points out, "[i]f extension is not part of the essence of material substances, then such substances can (at least by the power of God) exist without being extended" (p. 299). And, he notes, some authors were "sometimes prepared to hug this monster" (*ibid.*). In this chapter, I argue that Ockham himself was prepared to "hug this monster" *contra* Pasnau (2011). Specifically, I argue that, according to Ockham, extension is not essential to material substances but is accidental to them. Yet extension is *not* some entity in its own right (*res*), really distinct from the extended substance.

“corpuscular structure” is basic to physical reality or something “accidental or posterior” to it, something bodies can lack at least by divine power (pp. 279-280). Pasnau contends that whereas we now think that corpuscular structure is a “basic” or fundamental feature of bodies, most medieval authors thought of it as an accidental feature of them (p. 279). However, Pasnau argues, Ockham stands out among his contemporaries for holding the (modern) view that “corpuscular structure is intrinsic or essential to material substances” (p. 289).

Pasnau mostly focuses on “corpuscular structure” which he explains as having “extended integral parts” (p.279). (In what follows, when I say ‘part’ I mean ‘integral part.’) Thus, having corpuscular structure combines two features: (i) having parts; and (ii) those parts being spatially spread out, one outside (*extra*) the other. However, as Pasnau himself points out, (at least some) medieval authors distinguished between these two features.⁵⁶ In this chapter, I will use the term ‘extension’ as ‘being spread out *partem extra partem*’ and will distinguish this notion from having parts. I thus argue that *extension* (having *partem extra partem*) is not essential to bodies for Ockham. But since being extended is necessary for having corpuscular structure, as Pasnau understands it, corpuscular structure is not essential to bodies either (*contra* Pasnau).

According to Pasnau, Ockham’s opponents, whom Pasnau refers to as *quantity realists*, hold that quantity is a *real* accident: an entity in its own right (a *res*), really distinct from the material substance in which it inheres, which can be added to (or removed from) the substance without destroying it (p. 280).⁵⁷ On their view, corpuscular structure is not intrinsic to material substances, but instead some kind of superadded accident.

⁵⁶ On their view, what Pasnau calls the *B theory*, bodies have parts intrinsically and quantity (or extension) is what makes such parts be spread out in a continuous and unified way (Pasnau 2011, p. 280.)

⁵⁷ It’s worth noting that Pasnau seems to lump together two features that are best kept separate: (i) quantity as an *accidental* feature of bodies, that is, a feature that bodies *can* lack; and (ii) quantity as a *res*, really distinct from the material substance in which it inheres. As I shall argue below, although Ockham holds (i), he denies (ii).

Pasnau cites a few of Ockham's arguments against the quantity realists but doesn't find any of them convincing (pp. 289-293). Instead Pasnau takes Ockham's most effective argument against them to be a "challenge": if corpuscular structure is some accidental, superadded feature of a body, then "it ought to be possible... to have bodies that lack extension" (p. 293). Pasnau contends that "[t]he alleged incoherence of this lies at the heart of Ockham's case against quantity realism" (ibid.). (Since this is what Pasnau considers Ockham's most effective argument, in section III I focus on it.)

Pasnau considers three options for a body without quantity: (a) existence at a point; (b) lack of location altogether; and (c) holonmerism, that is, existing whole in the whole place and whole in any part of the place, as the soul is in the body (pp. 293-297). None of them is acceptable for Ockham according to Pasnau. So, the argument goes, bodies cannot lack extension. I take issue with (c) only. As I argue below, Ockham *allows* that bodies can exist holonmerically *contra* Pasnau. If so, it is possible for bodies to be unextended. Thus, extension is not essential to bodies for Ockham *contra* Pasnau.

Section II - A Counterexample to Pasnau: Ockham on the Eucharist

In *Reportatio* IV, q. 6, Ockham explains how Christ is present in the Eucharist.⁵⁸ To that end, he begins by examining the "nature of quantity" (*natura quantitatis*) (p. 71). "[Q]uantity,"

⁵⁸ As Adams explains in her (2010), starting with Aquinas, medieval authors thought the sacrament of the altar "makes the true body of Christ to be *really present*, so that by eating the faithful are truly joined with Christ" (emphasis mine; p. 85). But how does the Body of Christ get there? Where, and in what sense of 'where', is it? (ibid.). Like Aquinas, Scotus, and others, Ockham works out his explanation within "certain constraints" (ibid.). First, *sense perception* confirms that "the bread accidents or 'species' are still there on the altar, where they were before the consecration" (emphasis mine' p. 85). Moreover, by Aquinas's time, *theological consensus* lays it down that by means of the consecration, the true body of Christ (the very one that was born of Mary and crucified) comes to be 'on the altar,' 'contained by the sacrament' 'under the species' of bread that remain" (pp. 85-86). Likewise, then-received Christology insisted that the Body of Christ has ascended into heaven, where it will remain until

he says, “is nothing other than the *extension* of a thing having parts” (emphasis mine; p. 72).⁵⁹ (In what follows I will use ‘quantity’ and ‘extension,’ as well as ‘quantified’ and ‘extended’ interchangeably.) He maintains that when a substance (or quality) exists in a place as a whole in the whole and as a part in the part exclusively [*praecise*], then it’s said to be extended (p. 73). (In what follows I will refer to this way of being located in a place as *circumscriptive placement*.) But when it exists in a place as a whole in the whole and as a whole in the part, then it is not said to be quantified (*quanta*) (p. 73).⁶⁰ (I will refer to this as *definitive or holenmeric placement*.) This is how the soul was commonly thought to be in the body.

For example, consider my coffee cup C. Suppose that: C has three parts, C₁, C₂, C₃; C occupies some place P; and P is divided into parts P₁, P₂, P₃. Ockham holds that if C₁ exists in P₁, C₂ exists in P₂, and C₃ exists in P₃, then C is *extended*. However, if C were to be in P in such a way that all of C exists in P₁; all of C exists in P₂; and all of C exists in P₃, then C would be in P *holenmerically* and it wouldn’t be extended. (Since C in this example is a body with parts, P’s holenmeric placement would also imply that C₁, C₂, C₃ are in P₁; C₁, C₂, C₃ are in P₂; and C₁, C₂, C₃ are in P₃. As I explain below, Ockham allows for a body’s parts to overlap.)

Thus, Ockham holds that (H) if a substance exists in a place *holenmerically*, then it is not *extended*. As I explain below, in the Eucharist, Christ exists under the host holenmerically for Ockham. But, then, during the sacrament of the altar the body of Christ is unextended (by H). Since Christ’s body is a material substance, this shows that it is possible for a body to exist

Judgment Day and that the risen and ascended Body of Christ is glorified and hence impassible (emphases mine; p. 86).

⁵⁹ “*Dico tunc quod quantitas non est aliud nisi extensio rei habentis partes a quarum una ad aliam potest esse motus localis*” (OTh VII, p. 72). All translations are mine unless otherwise indicated.

⁶⁰ “*Et quando substantia vel qualitas sic coexistit loco quod totum coexistit toti et pars parti praecise, ita uni quod non alteri, tunc dicitur substantia vel qualitas quantitas, hoc est, tunc denominator ab illo conceptu et voce quae vocatur quantitas. Quando autem sic coexistit loco quod totum coexistit toti et totum cuilibet parti, tunc non dicitur quantitas nec quanta*” (OTh VII, p. 73).

without being extended. Thus, Ockham concludes that extension is *not* part of the essence of a material substance (*contra* Pasnau).

Ockham holds that, in the Eucharist, the body of Christ is in the host “in such a way that the whole [is] under the whole [species] and the whole [is] under any one part [of it]” (p. 79).⁶¹ That is: in the Eucharist, the body of Christ exists under the host hollenmerically. This means that Christ’s body is under the host without being extended (p. 80). But *how* can this be? Ockham explains: “Because [Christ’s body] is here neither quantitatively nor circumscriptively; for if so, then it would have part outside of part and where one part would be, the other wouldn’t be; and the whole would exist with the whole and one part with one part precisely, in a way that [it would] not [exist] with another” (p. 80). He continues: “*But* it doesn’t exist under the species of the bread in this way; rather, in such a way that the whole body of Christ exists under the whole host and the whole [body] under each part” (p. 80).⁶² (Later Ockham explicitly says that in the Eucharist “a substance is without quantity and extension” (p. 89).)

Now, the body of Christ is a material substance. So it is possible for a material substance to exist without extension, as in the case of the Eucharist. Therefore, being extended is not essential to a body *contra* Pasnau (2011). Ockham says this explicitly in his solution to some problems at the end of *Reportatio* IV, q. 6. His main idea is that, even though a material substance is divisible in itself, it is not essentially divisible into *extended* parts. Ockham explains:

I say that ... substance is divisible, since just as matter [is divisible] so is substantial form and quality. [...] However, truth has it that substance, according to itself and its essence, is not divisible into parts *distinct in place and arrangement*, since this does not pertain to

⁶¹ “*Et qui videret perfecte ista duo, videret quo modo corpus Christi existit sub specie panis, ita quod totum sub tota et totum sub qualibet parte*” (OTh VII, p. 79).

⁶² “*Et secundum istum modum ponendi potest salvari dictum: quomodo est ibi corpus Christi non habens modum quantitativum. Quia nec est ibi quantitative nec circumscriptive, quia si sic, tunc haberet partem extra partem et ubi una pars esset, alia non esset; et totum coexisteret toti et pars parti precise uni, ita quod non alteri. Sed non sic existit sub speciebus panis, sed sic quod totum corpus Christi existit sub tota hostia et totum sub qualibet parte....*” (OTh VII, pp. 80-81).

substance except *when it is extended*; and it can exist in itself essentially without any extension, and it can be verified thus. (emphases mine; p. 87)⁶³

Here I agree with Adams (2010): she maintains that “although it is essential to material substance, to matter, substantial form, and corporeal qualities to be divided into intrinsic parts, it is not essential to them that their parts be distinct in place and situation” (p. 161).

Let us briefly take stock. In this chapter, I aim to disprove Pasnau’s claim that extension is essential to bodies, according to Ockham. To this end, I provide a clear counterexample: Ockham’s account of the Eucharist. I argue that, for Ockham, Christ’s body is under the (consecrated) bread’s accidents *holenmerically*. But, Ockham maintains, if a substance is in a place in this way, then it is not extended (H). Thus, in the Eucharist, Christ’s body is not extended. Since Christ’s body is a material substance, then it is possible, at least by divine power, for a body to lack extension. Therefore, extension is not part of the essence of material substances for Ockham *contra* Pasnau.

In what follows, I assume Ockham’s premise (H), according to which if a substance exists in a place *holenmerically*, then it is not extended. This was a commonly accepted view, which Pasnau himself acknowledges and takes for granted (Pasnau 2011, p. 296). The problem lies with Ockham’s idea that the body of Christ exists under the (qualities of the) host *holenmerically*. For if this is accepted, then the conclusion that extension is not essential to

⁶³ One might object that here Ockham is talking about substance in general, that is, including material and *immaterial* substance, so that his conclusion does not tell us about the essence of *material* substances. However, that Ockham here is concerned with *material* substances, in particular, is clear from how he responds to the relevant *dubium*, according to which all think that “substance is indivisible”: he says that, just as matter, substance too is *divisible* (p. 81). But Ockham doesn’t think that immaterial substances are divisible. So here he is clearly thinking about material substances. Still he wants to draw attention to the idea that, nevertheless, material substances are not essentially extended.

bodies seems to follow (assuming that Christ's body is a material substance). But why does Ockham think that the body of Christ is in the Eucharist *holenmerically*?⁶⁴

Ockham begins his section on Christ's presence in the Eucharist thus: "it is not repugnant to the substance of Christ's body to be contained under the species of the bread" (OTh VII, p. 78). (I shall refer to this claim as [C]: Christ's containment by the host.) In saying this, Ockham is following *theological consensus*, according to which, through the consecration "the true body of Christ (the very one that was born of Mary and crucified)" comes to be on the altar "under the species of the bread" (Adams 2010, p. 86). (The "species of the bread" are the bread's accidents, e.g. the sensible qualities of the bread, such as its size, shape, color, and taste, that remain on the altar after the consecration, as our senses tell us.⁶⁵) What's interesting is the way Ockham *understands* Christ's containment by (or presence under) the host, namely, as *holenmeric* placement. In fact, he proves [C] by showing that it is (metaphysically) possible for something divisible, such as Christ's body, to exist "as a whole with some whole [e.g. the host] and with some of its parts" (OTh VII, p. 78).⁶⁶ And this is what I called above *holenmeric* (or *definitive*) placement, as Ockham defines it in his section on quantity (OTh VII, p. 73). But why does Ockham think that this is how we should understand Christ's presence under the host?

Under normal circumstances, Christ's body is larger than and differently shaped from the species of the bread.⁶⁷ So to be "contained" by the host, Christ's body cannot be there on the

⁶⁴ In his section on the Eucharist, Ockham offers three (main) arguments for the *holenmeric* presence of Christ in the sacrament of the altar and addresses two challenges to his view (OTh VII, pp. 78-81). In what follows I focus on the first two arguments, starting at lines 10 and 16 of p. 78, respectively. I choose to focus on these two because they shed light on what Ockham thinks about *the nature of bodies*. I also discuss both challenges below.

⁶⁵ Cf. Adams 2010, p. 85.

⁶⁶ I shall provide the entire argument below.

⁶⁷ In her (2010) Adams refers to this issue as the "size" problem (p. 87): "Generally speaking, a body is located in a place, only if its dimensions are commensurate with the dimensions of the place. But the Body of Christ is almost always bigger than and differently shaped from the bread accidents on the altar" (p. 87). So how can Christ's body come to be on the altar?

altar “circumscriptively or quantitatively,” i.e. in such a way that “the whole would exist with the whole and one part with one part *precisely*”; that is, as fully extended (OTh VII, p. 80).⁶⁸ Still, one might think that although Christ’s body is not fully spread out (or extended) on the altar, it is (spatially) spread out *at least a bit*, namely, as much as the host is extended. But Ockham does not countenance this option. Why?⁶⁹

It seems that, at least this text, *Reportatio* IV, q. 6, Ockham thinks that a substance (or quality) can be in a place in either of *two* ways: (i) quantitatively or circumscriptively, so that it is fully extended with “each part outside of each part” (*partem extra partem*); or (ii) hollenmerically, so that it is “as a whole” in each part of the place it occupies and it is *not* extended (OTh VII, pp. 73, 80). This means that, if a substance has (integral) parts, then in hollenmeric placement *all* of its parts would overlap in each part of the place it occupies.⁷⁰ Since evidently the body of Christ is not fully extended where the bread accidents are, then it must be there hollenmerically, or so Ockham seems to think.⁷¹ But first Ockham needs to establish that it is indeed metaphysically possible for a material substance, such as Christ’s body, to exist hollenmerically, that is, as the soul exists in the body. To this end, he provides three different arguments and addresses “two difficulties” (pp. 78-81). (In what follows I shall focus on the first two arguments and the first difficulty.)

⁶⁸ Rather, Ockham thinks that Christ’s body is under the host hollenmerically: “in such a way that the whole [is] under the whole [species] and the whole [is] under any one part [of it]” (OTh VII, p. 79).

⁶⁹ Ockham seems to hold this for theological reasons as well: cf. TdCC, ch. 7, OTh X, pp. 102ff.

⁷⁰ An immaterial substance is never extended and can only be in a place hollenmerically. Since it does not have (integral) parts, when it exists somewhere hollenmerically, there is no overlap of parts.

⁷¹ Thus, Ockham doesn’t seem to consider the possibility of just *some* parts overlapping. (By Ockham’s def on p. 78, having even only some parts overlapping would seem to *discount* a body from being extended.) Perhaps he also has theological reasons for this, e.g. that the *entire* body of Christ needs to be under each part of the host, so that no matter which piece of the host one gets one gets Christ’s body as a whole.

The first argument Ockham provides goes as follows: just as it is (metaphysically) possible for something *indivisible*, e.g. the intellective soul or an angel, to exist “as a whole with some whole and with any of its parts,” so it is possible for something *divisible*, e.g. Christ’s body (p. 78).⁷² For example in this way, e.g. hollenmerically, an angel exists in a place and the intellective soul is in the body (ibid).

Ockham’s reasoning here is startling. Recall what Pasnau says in his section on hollenmerism: if it seems bad to ascribe “this sort of whole-in-each part structure” to an immaterial substance, such as the human soul, “it must seem *unspeakably worse* to ascribe this sort of structure to *material* substances” (emphases mine; p. 297). But, contrary to what Pasnau thinks, Ockham argues from the case of immaterial substances to the hollenmeric placement of bodies. First, along with his Scholastic contemporaries, Ockham takes for granted that indivisible substances can, and in fact do, exist as a whole with a whole (place or body) and as a whole with any part (of a place or body). Next, he asserts that *just as* hollenmeric existence is “not repugnant” to something indivisible, *so* it is not repugnant to something divisible (OTh VII, p. 78). Thus, Ockham thinks that there is nothing incoherent about something *divisible* existing hollenmerically; and hollenmerism is compatible with divisibility as well as indivisibility.⁷³

Of course, one might object to the idea of a *divisible* body existing “as a whole with some whole and with any of its parts” (p. 78). Ockham seems to anticipate one such objection in his second argument for Christ’s (holenmeric) presence in the Eucharist. Here he focuses on the

⁷² “*Probatur, quia sicut non repugnat alicui indivisibili quod secundum se totum coexistat distinctis locatis, sicut angelus secundum se totum est in toto loco et in qualibet eius parte, similiter anima intellectiva se tota est in toto corpore et in qualibet eius parte, ita non repugnat divisibili quod se toto coexistat alicui toti et cuilibet eius parti*” (OTh VII, p. 78). Please note: I understand talk of non-repugnance as talk of metaphysical possibility (following Adams 2010).

⁷³ It’s worth noting here that, according to Ockham, something can exist hollenmerically while still having parts *contra* Pasnau, who does not seem to countenance this possibility in his text. (He thinks that hollenmerism is open only to those who think that a body without quantity would also lack parts (Pasnau 2011, p. 296).)

metaphysical possibility of overlapping parts. One fundamental difference between a divisible substance and an indivisible one is that the former has (integral) parts whereas the latter lacks them. Now, if a body has parts, then to exist as a whole in any part of a place entails that *all of the body's parts* exist in any one part of the place the body occupies. And if the parts of a body *cannot* overlap, then it would seem that a body cannot exist holomerically in some place. But this is precisely what Ockham denies in his second argument.

Briefly, Ockham argues that, (1) if something divisible (metaphysically) can exist with all of its parts in the same place and at the same time, then it can “exist with some whole as a whole and as all of its parts” (OTh VII, p. 78).⁷⁴ But (2) Christ's body can exist *with all of its parts* in the same place at once (ibid.). Therefore, Christ's body can exist *as a whole* in (any part of) a place at once.⁷⁵ (For a divisible body to exist as a whole in a place is to exist there as all of its parts.)

Of course, the crucial (and doubtful) premise is the second one. And Ockham provides two different reasons to believe it to be true.⁷⁶ First, he maintains, it is “naturally” (and thus

⁷⁴ In this argument, Ockham uses the phrase, “*esse simul secundum omnes suas partes*,” which can be literally translated as “to be in accordance with all of one's parts at once.” But what does this mean? This cannot simply amount to saying that all the parts of a divisible body can exist at the same time. For that would seem to be the normal case, as long as the parts are spatially spread out. I think by ‘*simul*’ in these contexts Ockham means ‘in *the same place* at the same time.’ In fact, a few lines below, Ockham says: “Some parts, which at first are distant, can be *simul*, in such a way that the parts that before existed in different places now exist in one place” (OTh VII, p. 78). Likewise, later Ockham contends that “it is no greater difficulty for two parts to be *simul* than for two bodies to be *simul*; but one can happen by the power of God, so can the other” (ibid. p. 79). Here again, the point is not merely that two bodies can exist at the same time (but in different places). Rather, the idea is that two bodies can exist at the same time *in the same place* by divine power, e.g. Jesus entering the closed doors, his coming out of the closed womb of the Virgin, etc. How about the expression ‘*secundum omnes suas partes*’? To say that a body exists with some other whole (body or place) *secundum omnes suas partes* simply amounts to saying that such a body exists, say, in one place “as all of its parts,” that is, all of its parts exist in such a place. Thus, to say that it is not repugnant to the body of Christ to exist *simul secundum omnes suas partes* means that it is not repugnant to the body of Christ that all of its parts exist in the same place at the same time, that is, that they all overlap.

⁷⁵ “*Praeterea, cuicumque divisibili non repugnat esse simul secundum omnes suas partes, ei non repugnat coexistere alicui toti secundum se totum et secundum omnes suas partes. Sed corpori Christi non repugnat esse simul secundum omnes suas partes*” (OTh VII, p. 78).

⁷⁶ He introduces each consideration with a “*tum quia*”: at line 20 on p. 78, and line 4 on p. 79, respectively.

physically) possible for some of a body's parts, which were distant at first, to come to occupy the same place (OTh VII, p. 78). This happens "when a rare body becomes dense" (ibid.). (That condensation involves colocation is a remarkable claim, with far-reaching implications.⁷⁷ I shall discuss this in greater detail in the Appendix.) Second, it is metaphysically possible, by divine power, for two bodies to overlap, as faith shows, e.g. Christ passing through closed door, his coming out of the closed womb of the Virgin, etc. Thus, it is "no more difficult" for two parts of the same body to occupy the same place at the same time (OTh VII, p. 79). So Ockham holds that it is not only metaphysically possible (by divine power) but also physically possible for the parts of a body to overlap. But if that's the case, then *all* the parts of a body can (at least by divine power) come to overlap in any one part of the place the body occupies. Consequently, it is metaphysically possible for the body of Christ to exist "as a whole," that is "as all of its parts," with the whole host and any of its parts.

Aside from the colocation of parts, another philosophical difficulty Ockham raises (and addresses) in connection with Christ's hollenmeric presence in the Eucharist is the multiple location of one and the same body.⁷⁸ Briefly, the problem seems to be this. If "numerically the same body" (*idem corpus numero*) exists hollenmerically in a place, then it exists as a whole in

⁷⁷ For example: in *Rep* IV, q. 6, Ockham seems to hold that [E] a body is extended iff it is in a place circumscriptively *precisely*. This implies that a body is extended iff there is *no* overlap of parts. Now what Ockham says in *Rep* IV, qq. 6 and 9 strongly suggests that condensation involves colocation of (at least some) parts. But if that's the case, then a condensed body would not be extended. Since condensation is a widespread *natural* phenomenon, it would seem that *even in the natural and normal case* bodies are not extended. I think Ockham would want to resist this conclusion. One way to do this might be to revise [E] thus: [E*] a body is extended iff it is not in a place hollenmerically or definitively, that is, in such a way that at least some of its parts do not overlap.

⁷⁸ This is the first of "two difficulties" Ockham raises in connection with his idea that Christ's body exists under the host hollenmerically (OTh p. 79). The second one is: "how many parts can coexist in one place" (OTh VII, p. 79). (I discussed this issue above in connection with Ockham's second argument, on p. 78.) The entire passage goes as follows: "*Itaque dico quod ad videndum quo modo corpus Christi existit sub specie panis apparent duae difficultates. Una, quo modo idem corpus numero potest coexistere pluribus secundum se totum. Alia quo modo multae partes possunt coexistere uni loco. Et qui videret perfecte ista duo, videret quo modo corpus Christi existit sub specie panis, ita quod totum sub tota et totum sub qualibet parte*" (ibid.).

each and every part of that place (OTh VII, p. 79). But if so, then numerically the same body exists as a whole in different (continuous) places at once. One might reasonably deny that a body *can* be multiply located at the same time and, thus, that Christ's body is under the host holonumerically. Not Ockham, though. Instead, he happily bites the bullet. In fact, he thinks that one and the same body can exist in different places, whether it is extended or not.

Ockham argues that “there seems to be no greater difficulty that numerically the same *body* exists as a whole in many places than that numerically the same intellective *soul* exists as a whole in the whole body and in any of its parts” (OTh VII, p. 79).⁷⁹ But we accept by “truth, theology, and philosophy” that intellective souls and angels exist holonumerically; so we can “easily” accept the multiple location of one and the same bodies (ibid.).⁸⁰

Moreover, Ockham even allows that one and the same body can be in several places at the same time “circumscriptively,” that is, in such a way that “the whole is in the whole and the part is in the part” (OTh VII, p. 98). For, he thinks, that some body is in distinct places circumscriptively seems “*less problematic (inconveniens)*” than that it is in distinct places holonumerically (or “definitively”) (ibid.). “But we hold the latter by faith, so the former is possible” (ibid.).⁸¹ For example, Ockham holds, Christ's body is at once located in heaven and

⁷⁹ “*Quantum ad primum, non videtur maior difficultas quod idem corpus numero coexistat pluribus locis secundum se totum quam quod eadem anima intellectiva coexistat secundum se totam in toto corpore et in qualibet eius parte, vel idem angelus existens in aliquo toto loco secundum se totum existat in qualibet parte illius loci. Sed unus ponimus secundum veritatem et theologiam et philosophiam, et qui videt unum potest faciliter videre aliud*” (OTh VII, p. 79).

⁸⁰ For, as I explained above, if a substance is in a place holonumerically, then it is “as a whole with the whole and as a whole with any part,” as the slogan goes. If so, then the substance is in multiple places at the same time.

⁸¹ “*Immo minus apparet inconueniens quod aliquod corpus sit in distinctis locis sic quod totum sit in toto et pars in parte quam quod sit in distinctis locis ita quod totum sit in toto et totum in qualibet parte. Sed secundum habemus ex fide, igitur primum est possibile*” (OTh VII, p. 98). [Note: what Ockham says here seems plausible (at least to some extent) and ingenious to me. For that holonumerism implies multiple location seems right. If, for example, the human soul can exist as a whole in each and every part of the body, then (numerically) the same soul exists in different *continuous* places at the same time. But if it can exist in different *continuous* places at the same time, then there doesn't seem to be any problem, at least in principle, with the soul existing as a whole in *discontinuous* places at once. And the fact that the soul is *immaterial* or *indivisible* doesn't seem to matter here, at least with respect to its

on the many altars where mass is said. Whereas His body is extended in heaven, it is “unextended in the host” (OTh VII, p. 88).⁸²

What Ockham says about Christ’s body has striking implications for the nature of bodies, at least *if* it can be generalized to all material substances. But one might object that the case of Christ’s body is *special*. After all, Christ’s body was thought to be glorified.⁸³ So one might think that what Ockham says here applies to glorified bodies only. However, Ockham makes clear that being glorified does *not* make a difference: “it is no greater difficulty that two bodies coexist in one place or two angels. And this *whether the bodies are glorified or not*, since two unglorified bodies can be in one place indifferently in such a way that either one would be in the whole place and in any part of it just as two glorified bodies, since glory or not glory does not contribute anything to this” (OTh VII, p. 80).⁸⁴ And we have no reason to think that glory would make a difference in any of the other questions at issue, such as the multi-location of bodies.

So: if (i) a substance either exists in a place fully extended or holenmerically (p. 73) and (ii) it is metaphysically possible for a body to exist holenmerically (pp. 78-80), then Christ’s body exists under the host holenmerically. For: (iii) it (clearly) is not fully extended under the host. But then it is possible for a material substance to exist without extension.

multiple location. Of course, the problem lies with accepting holenmerism to begin with. But this was a widespread assumption.

⁸² “*Ad aliud de corpore Christi dico quod secundum istam viam, substantia corporis Christi potest esse non extensa in hostia, et eadem tamen potest esse extensa in caelo. Nec est hoc inconueniens, quia in uno loco habet modum quantitativum, puta in caelo, non in hostia*” (OTh VII, p. 88).

⁸³ Cf. Adams 2010, p. 86. “[T]hen-received Christology insisted that the Body of Christ has ascended into heaven, where it will remain until Judgment Day” and that “the risen and ascended Body of Christ is glorified and hence *impassible*” (emphases mine; p. 86).

⁸⁴ “*Quantum ad secundum [i.e. that many parts can exist in one place at once]: non est maior difficultas quam quod duo corpora coexistant uni loco vel duo angeli eidem. Et hoc sive sint corpora non gloriosa sive gloriosa, quia indifferenter possunt corpora duo non gloriosa esse in uno loco, ita quod utrumque erit in toto loco et in qualibet eius parte sicut duo gloriosa, quia gloria vel non gloria nihil facit ad hoc*” (OTh VII, p. 80).

Section III – Addressing Pasnau’s main (textual) evidence

In his (2011) Pasnau says that, according to Ockham, it is “completely unacceptable” to think that (i) extension (=being spread out *partem extra partem*) is not essential to bodies, even though being extended may be their normal and natural state (p. 296).⁸⁵ Pasnau cites the following passage from Ockham’s *Tract. de corp Christi* (TdCC) in support of his interpretation:

Unless wood and in general every extended material substance were to have real and substantial parts, distinct in position, such a substance would be no more really extended than would the intellective soul. For just as the intellective soul is whole in the whole body and whole in each part, so every material substance would be whole under its whole quantity and whole under each part. That is absurd. (*Tract. de corp Christi*, ch. 12, OTh X:114.)⁸⁶

Pasnau explains that this is one of Ockham’s arguments for the claim that “every extended material substance is composed of substantial parts distant from one another in place or location” (p. 289, 297). That is, this is one of Ockham’s arguments for the claim that bodies have corpuscular structure essentially. “So understood,” Pasnau contends, “it is unquestionable: inasmuch as a body is extended, it must have *partem extra partem*” (p. 297).⁸⁷

Now, if in the passage above Ockham purports to show that extension (being spread out *partem extra partem*) is the intrinsic nature of bodies, as Pasnau argues, then this is *incompatible*

⁸⁵ According to Pasnau, Ockham deems the following position “*completely unacceptable*”: “that corporeal and incorporeal entities are not fundamentally distinct” and being spread out *partem extra partem* is merely accidental to bodies, so that “although it may be that in the natural world this is how bodies *always* are, still from a metaphysical point of view that is not their intrinsic nature” (emphases mine; p. 296).

⁸⁶ “*Item, nisi lignum et universaliter quaelibet substantia materialis extensa haberet partes reales et substantiales situ distantes, non plus esset talis substantia extensa realiter quam anima intellectiva. Sicut enim anima intellectiva est tota in toto corpore et tota in qualibet parte, ita substantia quaelibet materialis esset tota sub tota quantitate et tota sub qualibet parte. Illud autem est absurdum*” (OTh X, p. 114).

⁸⁷ Cf. Quodlibet IV, q. 9: “If any material substance did not have parts of the sort in question [e.g. integral parts that are locally distant from one another], then such a substance would not be extended any more than an intellective soul is. For just as an intellective soul exists as a whole in the whole body and as a whole in each part of the body, so too any material substance would exist as a whole under the whole quantity and as a whole under each part of quantity – which is absurd. [Therefore, every extended material substance has substantial parts [e.g. parts that are themselves substances] that are distant from one another in position, one of which can be destroyed while another is not destroyed; and even while those parts remain, they are able to be separated from one another and to be wholes – which I grant”] (p. 327).

with the account I presented in section II. For then extension would be essential to material substances *contra* my interpretation. Of course, Ockham could just be inconsistent. But I think what Ockham says here is actually compatible with my reading. In fact, in the passage above Ockham aims to show that every material substance is quantified through its own intrinsic parts, rather than some distinct *res* inhering in it. But this is compatible with the claim that extension (“having part distant from part”) is accidental to bodies. Moreover, later in the *same text* (TdCC) Ockham argues that “quantity is an accident” precisely because, as the case of the Eucharist shows, it is possible for bodies to lack extension (TdCC, ch. 34, OTh X, p. 192). But if Pasnau is right, Ockham would be inconsistent in the same work. In what follows I shall provide a careful reconstruction of the passage Pasnau cites from TdCC, ch. 12.

To begin with, the argument is supposed to be a *reductio ad absurdum*. Ockham wants to prove that [M] “every extended material substance” has “real and substantial parts” distant from one another; that is, that an extended material substance has *intrinsic* (integral) parts –not due to some distinct *res*, added to it – that are spread out *partem extra partem*. So he assumes [not-M]: that an extended material substance does *not* have “real and substantial parts” distant from one another. He then derives an absurd conclusion from that premise and proves [M].

What’s the absurd conclusion? (A) That “every material substance would be whole under its whole quantity and whole under each part” (OTh X, p. 114). Why is this absurd? For then “such a [material, extended] substance would be no more really extended than would the intellectual soul” (ibid.) But the soul is *not* extended. (For it exists in the body holomerically and, if something exists in this way, then it is not extended. Plus, the soul is indivisible.) Thus, a material substance would be extended and not “really” extended at the same time, which is absurd.

How does [A] follow from [not-M]? The target of Ockham's argument is the view that quantity (or extension) is some really distinct *res* that inheres in the material substance that is extended, what I shall call "quantity realism" (following Pasnau 2011). This is the view Ockham has in mind when he assumes [not-M]: an extended material substance, which does *not* have "real and substantial parts" distinct in place, is one composed of a "thin" substance (substantial form plus matter) and some other *res* inhering in it, that is, quantity. (I shall set aside all other accidents of the substance, such as its qualities, to make my discussion easier.) But on this account, Ockham argues, although the "thick" material substance (thin substance + quantity) is extended, e.g. it is spread out *partem extra partem*, the *thin* substance is not.⁸⁸ Rather, it exists under its quantity as the soul is in the body: whole in the whole and part in the part. And this is absurd, Ockham thinks.⁸⁹

For example: consider my coffee cup C again. Suppose: C has three parts: C₁, C₂, C₃; C occupies some place P; and P is divided into parts P₁, P₂, P₃. Moreover, by assumption, C is extended, so that C exists in P thus: C₁ exists only in P₁; C₂ exists only in P₂; and C₃ exists only in P₃. Now, according to Ockham, the quantity realist thinks that C's quantity (or extension) is really distinct from C's thin substance. In addition, whereas C's quantity is in P circumscriptively, that is, whole in the whole place and part in part of the place, C's thin substance is under such quantity *holenmerically*, that is, as the human soul is in the body. So, C's "thin" substance is *never* actually extended on this account, as Ockham understands it.⁹⁰

⁸⁸ I borrow the notions of thin and thick substance from Pasnau (2011).

⁸⁹ Is this actually absurd? Is Ockham's reconstruction of the argument accurate/fair? What might a quantity realist say in response to Ockham? Note well: I am not concerned here with (i) fairness of Ockham's reconstruction or (ii) evaluation of his argument. I just want to *understand* it.

⁹⁰ Why does Ockham think that, according to quantity realism, a body's thin substance would exist *holenmerically* under its quantity? For, on that view, the real accident of quantity is what makes a body's parts be spread out (and, for some, have parts as well). Thus, the thin substance without its quantity does not have spatially spread out parts

What is Ockham's conclusion then? Is it what Pasnau says, namely, that therefore extension (being spread out *partem extra partem*) is the intrinsic nature of bodies? I think not. Rather: Ockham's conclusion is that an extended material substance has (integral) parts, distinct in place, without the addition of some other entity, e.g. quantity, which inheres in it. To return to the previous example: Ockham thinks that, *when C* is extended, C's extension is *not* distinct from C. On his view, both C's thin substance and any one of its qualities are in P circumscriptively (whole/whole and part/part). C's substantial form, matter, and qualities all have parts intrinsically, and when a body is extended, such parts are in the place the body occupies circumscriptively. In *this sense*, a material substance (or body) is *intrinsically* extended (when it is extended). However, this does not amount to saying that a body is, therefore, essentially extended.

Thus, the argument above establishes only the *weaker* conclusion that, *when* a material substance is extended, this is due to the substance's own (intrinsic) parts' being spread out without the addition of some really distinct entity, e.g. quantity. But this is compatible with saying that it is possible for those parts *not* to be spread out in that way. Indeed, later in the very same work, Ockham argues that extension is an accidental feature of bodies, precisely because sometimes bodies lack extension, as the case of the Eucharist shows.

In TdCC, chapters 33 and 34, Ockham draws attention to an interesting problem: how can one say that "quantity is an accident" and yet that it is not a thing really distinct from the substance in which it inheres. (Here Ockham understands 'quantity' as "having part outside of part" or "having part distant from part," that is, as I use 'extension.' (TdCC, ch 34, OTh X, p.

(and it might lack parts altogether). But if that's the case *and* a substance is either in a place fully spread out or holo-merically, then the thin substance is under its quantity holo-merically.

192).) Ockham solves this problem thus: on the one hand, since a material substance, such as Christ's body, can be extended at one time and not extended at another, extension is an accidental feature of bodies (ibid., p. 192). On the other hand, Ockham argues, such a change is not due to some entity, really distinct from the substance, being added or removed from it, as in the case of a change of color. Rather, the change in extension is due to a change in the substance itself, namely, its parts going from being distant to one another to not being distant (and possibly overlapping). Thus, even though extension is *not* some superadded accident, it is accidental to bodies (*contra* Pasnau).

Thus, to sum up: Ockham holds that: (i) quantity is not some *res* distinct from the material substance that's extended (Anti-Realism); yet (ii) quantity is accidental to material substance (Accidentality); and (iii) it is a variable feature of material substance (Variability); finally, (iv) quantity is an extrinsic feature of it, that is, a body has a determinate (absolute) volume in virtue of two facts: (a) that a material substance is composed of integral parts *per se*; and (b) that some extrinsic agent causes such parts to be at a particular distance from one another at a particular time (Extrinsicality). I now turn to Buridan's realist pushback against Ockham's theory of quantity.

PART II: BURIDAN'S REALISM ABOUT QUANTITY

CHAPTER 3

BURIDAN ON THE ACCIDENTALITY, VARIABILITY, AND INTRINSICALITY OF QUANTITY

To understand Buridan's theory of quantity, a good place to start is his commentary on Aristotle's "On Generation and Corruption," book I, question 11 (henceforth GC I.11). In this question, Buridan examines what happens when a material substance, or body, rarefies. Buridan thinks that when a body rarefies, it acquires new volume while its substance and qualities stay the same. On his view, this increase in volume consists in the "generation" of quantity. Buridan goes on to explain both what he means by 'quantity' and how such quantity comes to be "generated." First, by 'quantity' he means: "some *res*... that makes [the parts of matter or of substance] come to be at a distance as a form (*distare formaliter*)" (p. 102).⁹¹ Second, in the natural process of rarefaction, this *res* is "generated or acquired, in such a way that the local motion of the parts does not suffice" (p. 102).⁹² This one short stretch of text sums up the key tenets of Buridan's theory of quantity. In the next two chapters I unpack what Buridan says here.

In this chapter, I examine how quantity is related to material substance. To do so, I look at two changes a body can undergo: one miraculous and the other natural. In the first (miraculous) case, I consider one and the same body with and without quantity. In the second (natural) case, I consider one and the same body with different quantities as a result of condensing and rarefying (C/R). In the next chapter, I focus on the ontological status of quantity.

⁹¹ (NB) Here I add "parts of matter or of substance" in parentheses as the subject of *distare* because of what Buridan says later in the same question, namely, that "*quod facit distare partes materiae vel substantiae est magnitudo* (p. 103).

⁹² *Mihi aliae autem conclusiones videntur esse ponendae. Prima est haec quod in rarefactione magnitudo generatur, hoc est dictum quod res aliqua sive dispositio aliqualis faciens formaliter distare generatur sive acquiritur, ita quod non sufficit solus motus localis partium* (emphases mine; *ibid.*, p. 102).

I explore two issues: (a) what kind of entity quantity is; namely, an accidental form, which inheres in substance (hence the use of the adverb “*formaliter*” above); and (b) *how* it exists, namely, in a strong sense as a substance (hence the use of the technical term ‘*res*’ in the passage above).

Buridan on Material Substance and Quantity

In his question-commentary on Aristotle’s *Physics* (henceforth QP), book I, chapter 8, Buridan investigates whether a body’s quantity reduces to its substance or whether it is something over and above the body’s substance.⁹³ Buridan argues that quantity is some entity (*res*) *other than* a body’s matter, substantial form, and qualities, by which they are three-dimensionally extended. Specifically, in Buridan’s view, quantity is an accidental form, which inheres in the substance of a body and which “intensifies” just as (natural) qualities like heat and color do. Just as more heat makes a substance hotter, so more quantity makes its substance bigger in volume.

Matter Without Quantity

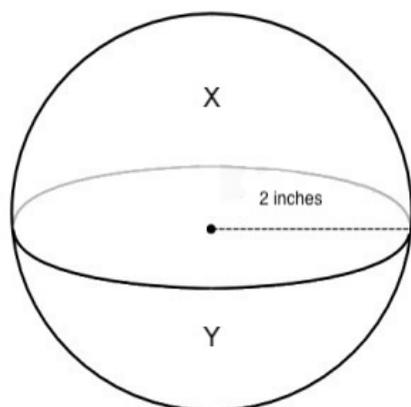
In QP I.8, Buridan distinguishes a body’s property of being divisible (and of having parts) from the property of having spatially distinct and spread out parts (pp. 80, 91). He holds that quantity is what accounts for a body’s having *spatially distinct and spatially extended* parts, but not for its having parts simpliciter. For, like Ockham, he believes that a material substance has really distinct parts *per se*. Buridan maintains that if God were to remove quantity from some matter, that matter would still have parts “distinct from each other” (*alias ab invicem*) but its parts would lose their location (*locus*) and position (*situs*) with respect to other parts. So, it would no longer

⁹³ Here by ‘substance’ I mean the composite of matter and substantial form, what Pasnau (2013) calls the “thin substance.”

be the case that parts are “outside each other” (*extra invicem*); that a part is “close to” (*propinqua*) or “far from” (*remota*) another; that a part is “above” (*supra*) or “below” (*infra*) another, etc.⁹⁴

To better understand Buridan’s view, let us look at a concrete example. This will help us hone in on Buridan’s relevant notion of parts and of their location and position, including how to pick out the parts of a body. Let us go back to the ball of wax I started with, having a radius of 2 inches and a volume of 33.51 inches³. Now consider two halves: its northern and southern hemispheres. Call them *x* and *y*, respectively.

Figure 2 – ball of wax, divided into hemispheres



As is evident from the figure above, *x* and *y* have determinate dimensions and volumes. For example, both *x* and *y* have a volume of 16.76 inches³. Their dimensions, respectively, are as

⁹⁴ QP I.8: “*Ad confirmationem dico quod remota magnitudine ab ipsa materia per potentiam divinam adhuc illa materia haberet partes alias ab invicem, sed non haberet partes extra invicem nec intra invicem situalter quia ablatius esset situs, qui est ratione magnitudinis. Nec esset localiter nec situalter pars parti propinqua vel remota, supra vel infra etc. sicut nec intelligentia est extra intelligentia situalter. Nec illa materia esset in loco circumscriptive vel commensurative. Nec inde sequeretur quod illa materia vel aliqua pars eius moveretur localiter, set forte instantanee, si sicut Deo placeret, ipsa prius habens positionem sive situm partium fieret non habens positionem et situm, et ipsa prius extensa fieret non extensa, et ipsa prius existens in loco fieret non existens in loco, vel existens in loco circumscriptive fieret in loco non circumscriptive absque hoc quod esset motus localis vel aliquis motus, sed solum mutatione instantanea, quae non est mutatio proprie, sicut postea de hoc dicitur in aliis libris.*” (emphasis mine; p. 91).

follows: height = 2 inches (equal to the radius); depth = 2 inches (equal to the radius); and width = 4 inches (equal to the diameter). The two hemispheres are spatially distinct in the sense that they do not overlap. The following spatial relations hold: x is contiguous with y ; y is contiguous with x ; x is above y ; y is below x , etc. Moreover, albeit distinct, x and y are such that together they make a whole.⁹⁵

It's worth noting that, like any other body, the ball of wax is a physical continuum. As such, Buridan holds, the wax is "infinitely divisible" and it "has infinitely many parts" in some sense, which he elucidates in detail in his so-called "treatise on infinity" in QP III.14-19. As Murdoch and Thijssen explain in their article, "John Buridan on Infinity," to say that a body is infinitely divisible amounts to saying that the number of parts of this body "is two, three, a hundred, etc. without end (*et sic sine statu*). Thus, there are infinitely many parts in a continuum because two, three, etc. or, more generally, a finite number, and a finite number greater than that finite number, and a finite number greater than that finite number... At bottom, the infinity of parts involved in the divisibility of a continuum is not opposed to the finite. It is an infinite that is rather like an 'unending finite'" (p. 134).⁹⁶ All that matters for our purposes is to choose any initial, exhaustive division into parts, enabling us to assign each part a determinate size, location, and position with respect to the others. Once we have this, we can then figure out what happens both in the case in which quantity is removed from the body altogether; and in the case in which one and the same body changes its volume due to condensation and rarefaction.

⁹⁵ Contrast the parts of the air contiguous to the wax (and "containing" the wax). Such parts are the proper place of the wax; they too are spatially distinct from them and next to them in the sense that there is no vacuum or other body between them. But they do *not* make a whole with the wax.

⁹⁶ John E. Murdoch and J. M. M. H. Thijssen, "John Buridan on Infinity," in *The Metaphysics and Natural Philosophy of John Buridan*, edited by J. M. M. H. Thijssen and Jack Zupko, pp. 127-150.

What would happen if God were to remove quantity from this ball of wax, with a radius of 2 inches and a volume of 33.51 inches³? Buridan believes that this ball of wax would still have “distinct parts.” The wax would not lose any bit of matter (or of substance). The wax’s matter, substantial form, and qualities would remain numerically the same. However, the wax would no longer have parts that are spatially distinct or three-dimensionally extended, so as to be in a particular place and position with respect to other parts. For example, consider the wax’s parts *x* and *y*. Without quantity, such parts would no longer be spatially distinct; nor would they be located where they are now or spatially related as they are now, e.g. in such a way that *x* is above *y* and *y* is below *x*. Neither the parts nor the wax as a whole would have determinate dimensions or volume at all.

Matter with different quantities

After looking at matter without quantity, let us now look at one and the same matter with different quantities, as a result of the natural phenomenon of condensation and rarefaction. In his commentary on Aristotle’s *On Generation and Corruption* (GC) I.11, Buridan defines quantity as that “which makes the parts of matter or of substance be distant from one another.”⁹⁷ Buridan seems to think that body *a* is distant (*distat*) from body *b* if, and only if, there is some body *c*, extrinsic to *a* and *b*, in virtue of which *a* is distant from *b*. For example, in his commentary on Aristotle’s *Metaphysics* book IV, question 9, Buridan maintains, “if I say that Socrates is distant from Plato, the term ‘is distant’ connotes some other thing (*res*) besides (*preter*) Socrates and

⁹⁷ John Buridan, *Quaestiones super libros De Generatione et corruptione Aristotelis*, edited by Michiel Streijger, Paul J. J. M. Bakker, and Johannes M. M. H. Thijssen (Brill 2010).

Plato and extrinsic (*extrinsecam*) to Socrates and Plato, namely, an intermediary dimension in virtue of which Socrates is distant from Plato.”⁹⁸

By contrast, body *a* is next to body *b* if, and only if, there is no other body or empty space between them. For example, in QP II.3, Buridan maintains that “body *a* is next to (*propinquum*) body *b* if there is no other body or vacuum in between [them]; and [*a*] is far [from *b*]... if there is some body between them (*intermedium corpus*).”⁹⁹ Finally, QP II.3 indicates what it is for a body to get closer to, or move further away from, another body. Body *a* gets closer to body *b* if, and only if, the body (*c*) between them gets smaller; and *a* gets further away from *b* if, and only if, the body between them (*c*) gets bigger.

Here I would like to briefly pause to reflect on the metaphysics of distance and proximity (including of changes thereof). In Buridan’s view, a body’s being distant from another body merely reduces to: (i) the two relata, namely the two bodies, existing outside one another; and (ii) a third body’s lying between them. Likewise, a body’s being next to, or contiguous with, another body merely reduces to: (i) the two bodies existing outside one another; and (ii) *no* third body lying between them. This is why in QP II.3 Buridan says that in order for two bodies “existing outside one another” to be next to, or distant from, each other “nothing is required that inheres in either one of them.”¹⁰⁰ As such, the property of being distant from (or next to) another body is an *extrinsic* property of a body. It is a property a body has in virtue of something extrinsic to it.

⁹⁸ QM Book IV, q. 9, fol. 32va: “*Similiter si ego dico Socratem distat a Platone ille terminus distat connotat rem aliam preter Socratem et Platonem et extrinsecam Socrati et Platoni scilicet dimensionem intermediam per quam Socrates distat a Platone.*” (Translated in Zupko 1993, p. 588)

⁹⁹ QP II.3: “*Et corpus a est propinquum corporis b, si non sit aliud corpus intermedium vel vacuum, et est remotum vel remotius, si est intermedium corpus aut minus aut maius. Et propter aliquid sic aliter se habere non requiritur aliqua eius mutatio nec suarum partium.*”

¹⁰⁰ See passage quoted in previous footnote.

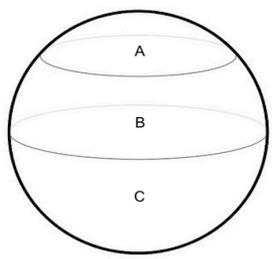
By contrast, Buridan thinks that a body's having a certain volume *does* require some *res* inhering in the body, which is distinct from its matter, substantial form, and qualities; and in virtue of which (*qua*) they all are spatially extended (so as to have a certain volume).¹⁰¹

Likewise, for Buridan, a body's having a certain temperature requires some *res*, namely the accidental form of heat, that inheres in the body's substance; and by which the body is hot (a maximally determinate amount). As such, a body's volume and a body's temperature are *intrinsic* properties of the body. They are properties the body has in virtue of something in it, and in virtue of nothing else.

Moreover, Buridan describes changes in the distance between two bodies as changes that are *extrinsic* to the relata.¹⁰² For a change in distance between two bodies simply requires that the body lying between them, in virtue of which one body is distant from another, increases or decreases in size. So, for example, consider again our original ball of wax, composed of three parts, *a*, *b*, and *c*, as represented in the figure below:

¹⁰¹ QP I.8: “*Constat bene quod causa huius reddi non potest, nisi ponamus dimensionem distinctam a materia et forma* [e.g. substantial form], *a caliditate et frigiditate et huiusmodi qualitatibus qua praedicta omnia sint extensa, sicut uno motu, quem vocamus localem, subiectum cum omnibus sibi inhaerentibus movetur. Sed huiusmodi dimensionem ponendo nos possumus tutum salvare. Dicimus enim quod, sicut albedo dat esse album formaliter, sic magnitudo, quae est extensio, dat esse extensum et magnum*” (pp. 88-89)

¹⁰² QSP II.3, fol. 31ra-rb (Paris 1509, 1964 ed): *Propter ultimam rationem notandum est cum diligentia quod aliqua res manens eadem tripliciter potest se habere aliter et aliter q de ipsa id est de termino supponente pro ipsa verificentur praedicata contradictoria prius et posterius vel etiam q de illo termino vere affirmetur et negetur idem praedicatum prius et posterius. Primus modus est si illud praedicatum sit connotativum alicuius extrinseci, tunc enim propter existentiam vel non-existentiam (aut propter aliam mutationem) illius extrinseci possibile est illud contingere ut [homo est pater si est eius filius et illo non existente non est pater et hom est dives si sunt divitiae sibi applicatae et est pauper si pereant vel alteri applicentur et] corpus a est propinquum corporis b si non sit aliud corpus intermedium vel vacuum et remotum vel remotius si est intermedium corpus minus aut maius et propter aliud sic aliter se habere non requiritur aliqua eius mutatio aut suarum partium. Secundus modus est si illud praedicatum connotat situm partium illius rei ad invicem, et tunc ad sic se habere aliter et aliter requiritur motus locales illarum partium vel alicuius earum, et nihil plures praeter ea quae ante erant. Ideo cessante motu, qui non est permanens, nihil aliud est posterius quod non esset prius, et nihil etiam erat prius quod non sit posterius; et sic est de sedere et stare, de esse rectum ad curvum, sphaericum aut cubicum, et sic de aliis figuris. Tertius modus est si illud praedicatum nec connotat aliquid extrinsecum nec connotat habitudinem partium illius rei ad invicem, et tunc nulla causa apparet mihi naturalis nisi quia illi rei est aliqua res addita generata vel corrupta; sic enim est homus albus et non albus, vel albus et niger, prius et posterius, et sic potest scire et argui distinctio formarum et accidentium a substantiis suis.*



Part *a* is distant from part *c* in virtue of the fact that part *b* lies between them. For Buridan, all that is needed for *a* to be *more* distant from *c* is that *b* gets bigger.

By contrast, Buridan thinks of a change in the volume of a body as an *intrinsic* change: it requires that the body's own quantity, which is an accidental form, inhering in its substance, acquire new parts, or degrees, or lose old ones. In QP I.8, Buridan maintains that, just as some white thing cannot become whiter except by *the generation of a new part of whiteness* (and it cannot become less white except by the corruption of a part of whiteness); so something extended cannot become more extended without *some generation of extension in addition to the preexisting extension* (and it cannot become less extended without the corruption of some magnitude).¹⁰³ This process is called intension and remission of forms.¹⁰⁴ What matters for our purposes is the fact that a change in distance between two bodies is a change extrinsic to them whereas a change in a body's volume is a change intrinsic to it.

Buridan on condensation and rarefaction

¹⁰³ The following passage is a continuation of the text provided in the previous fn: *Et sicut in eodem subiectum plus de albedine dat esse albius et plus de caliditate calidius, ita plus de magnitudine maius et extensius. Ideo etiam sicut idem prius album non potest fieri albius nisi per generationem albedinis in eo cum albedine precedente, nec fieri minus album nisi per corruptionem partis albedinis, ita idem existens magnum non potest fieri maius sine aliqua generatione magnitudinis cum magnitudine preexistente nec fieri minus sine corruptione magnitudinis* (QP I.8, 2015 ed, p. 89).

¹⁰⁴ I explain this process in more detail in the next chapter, where I examine the ontological status of quantity.

In GC I.11, Buridan maintains that rarity makes the parts of matter (or of substance) be *more distant* from one another (*facit distare partes magis*) while density makes such parts be *less distant* from one another (*facit distare minus*).¹⁰⁵ By the theory of proximity and distance laid out above, this means that, given two parts between which there is some other part, or body, rarity makes it the case that the body lying between them is bigger; and density makes it the case that the body lying between them is smaller. But, as Buridan explains in detail in QP IV.11 this can happen in two ways: one way is what Buridan calls condensation and rarefaction (C/R), *strictly speaking*; the other way is what Buridan calls C/R, *broadly speaking*. Whereas the former involves a change in the absolute volume of the body, the latter involves a change in the *apparent* volume of the body but not its absolute volume. For: when a body increases or decreases its (apparent) volume in the case of C/R broadly so-called, the change is due to some *other* stuff or substance entering or exiting the original body and thereby causing its parts to lie closer or further away from each other. (Recall Descartes' sponge.)

Buridan's theory of C/R strictly so-called lies at the heart of his theory of quantity. For Buridan thinks that we can explain (*salvare*) this phenomenon *only* by positing the existence of some *res* distinct from a body's matter, substantial form, and qualities; and in virtue of which they are spatially extended and the body has a certain volume. By contrast, Buridan thinks that Ockham's reductionist view is unable to account for for this phenomenon.

What Buridan calls "condensation and rarefaction, strictly speaking" corresponds to the Scholastic understanding of C/R. As I explained in Chapter 1, on this view, when a body condenses or rarefies:

¹⁰⁵ "*Secunda conclusio [est] quod raritas est magnitudo, quia non videtur raritas differre a densitate in eodem subiecto, nisi quia raritas magis facit distare partes et densitas minus; sed quod facit distare partes materiae vel substantiae est magnitudo; igitur raritas est magnitudo*" (QdeGen I.11).

- (i) its volume changes;
- (ii) its substance remains the same;
- (iii) there is no vacuum between the body's parts;
- (iv) and no *other* body comes to be between the (condensing or rarefying) body's parts.

These are the assumptions that Buridan shares with Ockham.

By contrast, Descartes' "sponge model" of C/R is what Buridan calls C/R broadly so-called. Buridan uses the example of wool. In QP IV,11 Buridan explains that "'rarefaction' and 'condensation' are sometimes taken broadly (*capiuntur improprie*): namely, when subtle bodies (*corpora subtilia*) are contained (*interclusa*) between thick bodies (*corpora grossa*); as, for example, there are many parts of air between the parts of wool" (QP IV.11, p. 299). In this case, if the parts of the wool are compressed at once (*comprimantur simul*), the wool (*pondus lanae*) appears (*videtur*) to occupy a smaller place and to be denser, because the parts of air go out (*exeunt*). Likewise, once the compression stops (*remissa compressione*) the parts of wool move away from one another (*elongantur ab invicem*) and the parts of the surrounding air (*partes aeris circumstantis*) enter between them (*subintran inter eas*); thus, the wool (*cumulus lanae*) appears to occupy a bigger place and be rarer. (ibid.)

But, Buridan maintains, a body is said to rarefy, strictly speaking, if it comes to be bigger (*fiat maius*) without any external body entering between its parts. And a body is said to condense, strictly speaking, if a body comes to be smaller, without any body exiting from it, which was contained between its parts before (QP IV.11, p. 300).

So, in Buridan's view, what characterizes rarefaction or condensation, strictly understood, is that every "quantitative part" of a body that rarefies itself rarefies; and any "quantitative part" of a body that is condensed is itself condensed (QP IV, p. 300). And this

occurs “in such a way that every quantitative part of a rare body is rare and every quantitative part of a dense body is dense” (ibid.).¹⁰⁶ What Buridan means by ‘quantitative part’ here is a part that is spatially distinct from another (*partem extra partem*), having a specific location and position with respect to other parts, as I have discussed above (when I examined matter without quantity). So, in his view, when a body condenses or rarefies, strictly speaking, every one of its spatially distinct parts condenses or rarefies, respectively. However, this feature is not true of rarefaction and condensation, broadly understood; for in this case no parts really condense or rarefy; the bits of wool merely move closer together or further apart.

It is precisely because of this difference between C/R strictly so-called and C/R broadly so-called that in GC I.11 Buridan says that when a body rarefies, it acquires new volume *in such a way that the local motion of the parts does not suffice*.¹⁰⁷ For: if we were to assume that when a body condenses or rarefies, strictly speaking, there is only local motion of the parts, then either the parts would interpenetrate (and come to be co-located) or a vacuum between them would have to be assumed. And neither option can occur naturally. This is where Ockham’s mechanistic account of C/R fails.

In QP IV.11, Buridan describes this scenario in vivid detail as an argument one might offer against the idea that C/R (strictly so-called) is possible:

If there were condensation, the individual, outermost parts of a body that is condensed would come to be closer to one another by moving towards the center of that body; and in this way the parts on the right (*partes dextrae*) would not yield (*non cederent*) to the parts on the left (*sinistris*), but would move against (*moverentur contra*) them; the parts in

¹⁰⁶ “*Et est proprietas huiusmodi rarefactionis aut condensationis quod eius quod rarefit quaelibet pars quantitativa rarefit et eius quod condensatur quaelibet pars condensatur; ita quod quaelibet pars quantitativa rari est rara et densi densa. Quod non est in rarefactione et condensatione improprie dicta, immo in prius dicta rarefactione essent partes densae, scilicet lanae, et partes rariae, scilicet aeris*” (QP IV.11, p. 300).

¹⁰⁷ GC I.11: “*Mihi aliae autem conclusiones videntur esse ponendae. Prima est haec quod in rarefactione magnitudo generatur, hoc est dictum quod res aliqua sive dispositio aliqualis faciens formaliter distare generatur sive acquiritur, ita quod non sufficit solus motus localis partium*” (emphases mine; ibid., p. 102)

front (*partes ante*) would not yield to the parts in the back (*partibus retro*); and the parts below (*partes infra*) would not yield to the parts above (*partibus supra*). [Rather, such parts would move against each other.] But it is impossible for the parts to move against each other in this way [*sic eas moveri contra invicem*]. For: either they would be in a plenum..., and thus there would be a penetration of dimensions, which is considered to be impossible; or they would be in a vacuum, which is also impossible naturally. So: [condensation is not possible].

Similarly, one could argue about rarefaction that: it would be necessary for the outermost parts everywhere (*undique*) to move away from each other [*elongari ab invicem*]; and then either there would remain empty spaces (*vacuitates*) between each other or other bodies would have to enter from outside (*ab extrinseco*) in between the parts moving away from one another in this way (*sic ab invicem recedentes*), which does not appear to be possible.” So: rarefaction too is not possible.

Thus, Buridan argues that, when a body rarefies strictly speaking, its quantity (*magnitudo*) “intensifies,” as I shall explain below, and it makes each part of matter and of substance bigger. Consequently, parts that were originally distant from each other come to be *more* distant because of some other part lying between them which increases in size. Now, to say that “quantity intensifies” means that: some *res*, distinct from the substance and inhering in it, acquires or loses parts (or degrees) just as qualities such as heat and color do. As a result of this process, a body and its parts increase their volume.

Buridan on Change of Shape

Even though Buridan is a realist about quantity, he is a reductionist about shape. In QP II.3, Buridan maintains that shape *just is* quantity (p. 257). He says that “shape is not distinct from shaped quantity” (p. 257). Since quantity is distinct from substance, shape too is distinct from

substance. But shape is nothing other than quantity.¹⁰⁸ That is, shape is no new thing (*res*) in addition to quantity.

Buridan holds that, when a body changes shape, say, from round to square, no new *thing* is added; and no old thing is corrupted. One would still find numerically the same matter, substantial form, qualities, and quantity before and after the change in shape. In Buridan's view, all of these beings are *res*: "things" that exist in the same (strong) sense in which a substance exists, and which can be separated from one another by divine power. Such things would remain constant through change in shape. By contrast, when a body (say) rarefies, a new thing, e.g. a new quantity, is generated. So, one would *not* find numerically the same matter, substantial form, qualities, and *quantity* before and after rarefaction: a numerically distinct quantity would be present after rarefaction.

It is worth noting that, when Buridan says that shape is not a thing (*res*) other than quantity, he does not mean that there is no new fact about the world when the object has a new shape. Rather, he means that there is no need to postulate the existence of some thing, in addition to quantity, to account for this fact.¹⁰⁹ In QP II.3, Buridan argues for his reductionist position on shape by first raising a realist objection to his view; and then by refuting the objection.

The objection goes as follows. Consider a certain volume of wax, say, 4 ounces (=7.2 cubic inches). Buridan holds that the wax can change shape from, say, "cubic" to "spherical" (and vice versa), while its volume (of 4 oz) remains the same. But then one and the same volume of wax is at first cubic and later not cubic, but spherical. Thus, Buridan notes, it might seem that

¹⁰⁸ QP II.3: "*Tunc ponuntur conclusiones. Prima est quod omnis figura est distincta a figurato quod est substantia. Probatio quia: omnis magnitudo est distincta a substantia, ut suppono; et omnis figura est magnitudo, ut apparebit per aliam conclusionem. Secunda conclusio est quod nulla figura est distincta a primo figurato; vel sic: nulla figura est distincta a magnitudine figurata*" (p. 257).

¹⁰⁹ Cf. Arlig 2012.

“cubicity” (*cubicitas*) and “sphericity” (*sphaericitas*) are features of the wax that are distinct from one another and from its volume. Moreover, it is in virtue of this distinction between them that numerically the same volume of wax is now cubic, and now spherical. Buridan contends that realists about shape ought to argue that, if a given volume of wax goes from cubic to spherical, then “a certain thing (*res*) that at first inheres in the quantity of the wax is corrupted, namely, cubicity; and some other thing is generated that later inheres in the quantity, namely, sphericity” (QP II.3, p. 257).¹¹⁰

To refute this realist line of argument, Buridan proposes the following: if one can prove that change of shape does not occur through the generation or corruption of some thing (*res*), then “one must concede that shape is not distinct from shaped quantity” (QP II.3, p. 258).¹¹¹ He thus proceeds to show that when the wax changes shape, no thing is either generated or corrupted. Rather, when a body changes shape, some of its parts get closer *and* some of its parts get further away from one another solely in virtue of local motion.

Specifically, Buridan offers the following argument. (P1) A body of a certain volume can be shaped now this way, now that way “solely in virtue of the fact that some of its parts get

¹¹⁰ “*Tunc ponuntur conclusiones. Prima est quod omnis figura est distincta a figurato quod est substantia. Probatio quia: omnis magnitudo est distincta a substantia, ut suppono; et omnis figura est magnitudo, ut apparebit per aliam conclusionem. Secunda conclusio est quod nulla figura est distincta a primo figurato; vel sic: nulla figura est distincta a magnitudine figurata. Ista conclusio sic declaratur: magnitudo enim cubica remanens eadem potest fieri sphaerica et e converso, ut magnitudo huius cerae. Et sic ista magnitudo manens eadem se habet aliter et aliter prius et posterius tali modo quod de subiecto supponente pro ipsa verificatur idem praedicatum prius affirmative et postea negative. Prius enim est cubica et posterius non est cubica. Et ex hoc prima facie videtur quod cubicitas et sphaericitas sint diversae dispositiones ab invicem et a magnitudine; propter quarum diversitatem illa magnitudo habet se aliter et aliter. Igitur omnes credentes quod figura sit res distincta a magnitudine figurata habent dicere quod, si magnitudo cubica fiat sphaerica, quaedam res prius inhaerens illi magnitudini corrumpitur, scilicet cubicitas, et quaedam res alia generatur postea inhaerens illi magnitudini, scilicet sphaericitas. Ideo si potest probari quod non corrumpitur sic aliqua res nec generatur alia, debet concedi quod figura non est distincta magnitudine figurata.*” (QP II.3, pp. 257-258)

¹¹¹ See text above.

closer to one another and other parts get further away from each other” (QP II.3, p. 258). But (P2) in this way (e.g. by the parts’ getting closer or further away) neither is a new thing generated nor an old one corrupted (ibid.). So, Buridan concludes, shape is not a thing distinct from the shaped quantity (p. 258).¹¹²

To illustrate P1, Buridan uses the example of manipulating a piece of wax. Consider a spherical ball of wax. Imagine “three diameters intersecting each other at right angles”; call them length, width, and depth: l , w , d . Now imagine that I compress the wax along its length and width so that: (i) l ’s extremities get closer to one another; (ii) w ’s extremities get closer to one another; but (iii) d ’s extremities come to be further away from each other. In virtue of this compression of the wax (*compressio cerae*) and “without any other change,” the body becomes oval and is no longer round (p. 258).¹¹³

Let us assign some specific measures to the three dimensions of the wax to make the example clearer. Consider a (spherical) ball of wax with a radius of 2 inches and a volume of ca. 33.51 cubic inches (=ca. 18.5 oz). Its length, width, and depth are each 4 inches long. Now suppose that I squeeze the wax along its length and width, so that they both now measure half of their original sizes, that is, 2 inches each. By contrast, its depth quadruples and now measures 16 inches. The volume stays the same.¹¹⁴ (See Table 1 below.)

¹¹² “*Probo igitur quod non sic corrumpitur una res et generatur alia. Et arguitur sic: magnitudo potest sic aliter et aliter figurari per solam approximationem aliquarum suarum partium ad invicem et elongationem aliarum ad invicem; sed per solam huiusmodi approximationem vel remotionem non generatur aliqua nova res quae ante non esset, nec corrumpitur aliqua quae ante esset; igitur, etc.*” (QP II.3, p. 258)

¹¹³ “*Maiores est satis manifesta, ita quod sufficit mihi declaratio exemplaris, scilicet quod si cera sit sphaerica et imaginetur tres diametri intersecantes se ad angulos rectos, quae vocentur longitudo, latitudo, et profunditas, sive a, b, c, et fiat compressio cerae secundum a [longitudo] et secundum b [latitudo], ita quod extremitates ipsius a approximetur ad invicem et similiter extremitates ipsius b, tunc enim extremitates ipsius c elongabuntur ad invicem et per hoc sine alia mutatione corpus illud, quod ante erat sphaericum, fiet oblongum et non erit amplius sphaericum. Et sic patet maior.*” (QP II.3, p. 258)

¹¹⁴ For the volume of a sphere, $V = \frac{4}{3}\pi r^3$; for the volume of an ellipsoid, $V = \frac{4}{3}\pi abc$ (where a, b, and c are half of its l, w, and d).

Table 1 – change of shape

| | |
|---|--|
| At t1, the wax sphere has: l = 4 inches w = 4 inches d = 4 inches r = 2 inches Volume 1 = 33.51 cubic inches | At t2 the wax is an oblong solid (called ellipsoid) with dimensions: l = 2 inches w = 2 inches d = 16 inches Volume 2 = 33.51 cubic inches |
|---|--|

By contrast, now consider the same sphere of wax undergoing C/R strictly so-called. Suppose, first, that the original ball of wax condenses so that its three dimensions (l, w, and d) now measure a half inch less each. Its (absolute) volume would decrease by ca. 11 cubic inches. (See Table 2 below.) Suppose, second, that the ball of wax rarefies so that its three dimensions now measure an extra half inch each. Its volume would now increase by about 14 cubic inches. (See Table 3 below.)

Table 2 – example of condensation strictly so-called

| | |
|---|--|
| At t1, the wax sphere has: l = 4 inches w = 4 inches d = 4 inches r = 2 inches Volume 1 = 33.51 cubic inches | At t2 the wax is condensed with dimensions: l = 3.5 inches w = 3.5 inches d = 3.5 inches r = 1.75 inches Volume 3 = 22.45 cubic inches (11.06 cubic inches less than original volume) |
|---|--|

Table 3 – example of rarefaction strictly so-called

| | |
|-------------------------------|---|
| At t1, the wax sphere has: | At t2 the wax is rarefied with dimensions: |
| l = 4 inches | l = 4.5 inches |
| w = 4 inches | w = 4.5 inches |
| d = 4 inches | d = 4.5 inches |
| r = 2 inches | r = 2.25 inches |
| Volume 1 = 33.51 cubic inches | Volume 4 = 47.71 cubic inches (14.2 cubic inches more than original volume) |

Buridan thinks that when the wax changes shape while its volume remains constant, *local motion alone suffices* to explain the change in the distance between its parts (and the change in the measure of the three dimensions). For, as the example above shows, when the wax changes from round to oval in shape, some of its parts get closer and some of its parts get further away. And to account for this kind of change one can keep the initial sizes of the parts (howsoever picked out to begin with) fixed and simply re-arrange them so as to get a new shape.

By contrast, as I explained above, when a body changes volume because of C/R strictly so-called, local motion alone does not suffice to explain the change in distance between its parts. Rather, this change is due to an intrinsic change in the size of its parts (*contra* Ockham). Buridan thinks that such a change does require the generation of some (new) thing, which was *not* there before the change occurred; or the corruption of some (old) thing, which was there to begin with.

This is such a key feature of quantity that Buridan embeds it in the definition that we started with in this chapter and which Buridan offers in his commentary on Aristotle's "On Generation and Corruption": "in rarefaction," he says, "quantity is generated, that is, some thing

(*res*) ... that makes [the parts of matter or of substance] be distant is generated or acquired, in such a way that the local motion of the parts does not suffice” (GC I.11, p. 102).¹¹⁵

As Buridan explains at the end of QP II.3, there are three ways in which “one and the same thing can come to be now this way, now that way” (*aliqua res manens eadem tripliciter potest se habere aliter et aliter*) (QP II.3, p. 261). First, one and the same thing may be said to be one way at first, and another way after, *because of some change in something extrinsic to it* (ibid.). For example, “a man is a father if he has a son; and if the son did not exist, he would not be a father” (ibid.). Second, one and the same thing may be said to be one way now and another way later because of a *change in the position of the parts with respect to one another* (ibid.). In this case, all that’s required is “the local motion of the parts or of some of them; and nothing more than the things that were before” (QP II.3, p. 262). And this is true of “sitting and standing”; as well as of changes in shape, such as from straight to curved (ibid.). Third, numerically the same thing can be one way at first, and another way afterwards, because of “some thing” (*aliqua res*) being generated or added to it or corrupted. For example, if a man is white and then is not white, this occurs because some thing, namely, the accidental form of whiteness, at first inheres in the man; and then is corrupted, so that it no longer inheres in him.¹¹⁶

¹¹⁵ “*Mihi aliae autem conclusiones videntur esse ponendae. Prima est haec quod in rarefactione magnitudo generatur, hoc est dictum quod **res aliqua sive dispositio alicuius faciens formaliter distare** generatur sive acquiritur, ita quod non sufficit solus motus localis partium (emphases mine; QGC I.11, p. 102).*

¹¹⁶ *Propter ultimam rationem notandum est cum diligentia quod **aliqua res manens eadem tripliciter potest se habere aliter et aliter** quod de ipsa, id est de termino supponente pro ipsa, verificentur praedicata contradictoria prius et posterius, vel etiam quod de illo termino affirmetur et negetur idem praedicatum prius et posterius. **Primus modus** est si illud praedicatum sit connotativum **alicuius extrinseci**. Tunc enim propter existentiam vel non existentiam aut propter aliam et aliam mutationem illius extrinseci possibile est illud contingere ut homo est pater si est eius filius et illo non existente non est pater. Et homo est dives, si sunt divitiae sibi applicatae, et est pauper, si pereant aut alteri applicentur. Et corpus a est propinquum corporis b, si non sit aliud corpus intermedium vel vacuum, et est remotum vel remotius, si est intermedium corpus aut minus aut maius. Et propter aliud sic aliter se habere non requiritur aliqua eius mutatio nec suarum partium. **Secundus modus** est, si illud praedicatum connotat **situm partium illius rei ad invicem**. Et tunc ad sic se habere aliter et aliter requiritur motus localis illarum partium*

This passage is instructive. All three kinds of changes described here are relevant for Buridan's theory of quantity. First, both in cases of change of volume and change of shape, changes in the distance between the parts of a body are involved. But when two parts of a body get closer to or more distant from each other, this occurs in virtue of some other body lying between them, getting bigger or smaller. Second, a change in shape is one that occurs merely in virtue of a change in the position of the parts with respect to one another as a result of local motion alone. Finally, Buridan believes that a change in volume is one which occurs in virtue of some thing being generated, or added, to the body; or some thing in the body, namely, (a part or degree of) its quantity being corrupted.

So even though Buridan is a realist about quantity, he is a reductionist about shape. Moreover, even though quantity determines a body's volume, it does not determine its dimensions and shape. One and the same quantity must have some shape or other, but it need not have this shape or that shape. Quantity as well as the arrangement of the parts determine what shape and dimensions a body has. But whereas the quantity of a body is some *res* other than its substance and quality, the arrangement of its parts is not some extra thing.

Upshots

On my interpretation, Buridan successfully shows that Ockham is unable to explain how C/R, *strictly speaking*, is possible by appealing only to the local motion of the parts of a material

*vel alicuius earum et nihil plus praeter ea quae ante erant. Ideo cessante motu, qui non est permanens, nihil aliud est posterius quod non esset prius, et nihil etiam erat prius quod non sit posterius; et sic est de sedere et stare, de esse rectum ad curvum, sphaericum aut cubicum, et sic de aliis figuris. Tertius modus est, si illud praedicatum nec connotat aliquod extrinsecum nec connotat habitudinem partium illius rei ad invicem, et tunc nulla causa apparet mihi naturalis nisi quia **illi rei est aliqua res addita, generata vel corrupta**. Sic enim est homo albus et non albus, vel albus et niger, prius et posterius et potest sciri et argui distinctio formarum et accidentium a subiectis suis.” (QP II.3, pp. 261-262).*

substance. By contrast, Buridan is able to account for C/R strictly so-called by appealing to an intrinsic change in size of the parts of a material substance, understood as the generation (or corruption) of an accidental form, inhering in the substance. Interestingly, Descartes *is* able to explain C/R via the local motion of a body's parts only by focusing on C/R *broadly so-called*. So, even though both Ockham and Buridan's mereological conception(s) of material substance anticipate later (17th century) corpuscularianism, they still work within an Aristotelian metaphysical framework, which limits their ability to explain natural phenomena, such as C/R, in terms of matter and local motion (alone).

CHAPTER 4

BURIDAN ON THE ONTOLOGY AND META-ONTOLOGY OF QUANTITY

In sections I and II of this chapter, I aim to reconstruct Buridan's ontology and meta-ontology of quantity, respectively. Buridan holds that quantity is an accidental form, which increases and decreases in a way that is analogous to the intension and remission of qualities. Moreover, as I explain in section II, Buridan thinks that, like quality, quantity is a *res*: it exists in the same way that substances do. He is thus a strong realist about quantity, and quantity is a so-called "real accident." Finally, in section III, I sum up Buridan's theory of quantity, weaving together all of its key components: the intrinsicality, accidentality, and reification of quantity.

Section I: Ontology of Quantity

In his commentary on Aristotle's "On Generation and Corruption" (QGC), Book I, question 11, Buridan defines quantity as the "*res*" which makes the parts of matter or of substance be distant "*formaliter*" (p. 102). I explain in detail what Buridan means by *res* in the next section. Here I focus on the adverb '*formaliter*.' Buridan makes clear what he means by this expression in his commentary on Aristotle's *Physics* (QP) Book I, question 8, where he describes in more detail what kind of being quantity is.

In QP I.8, Buridan offers an ontological theory of quantity that is analogous to his theory of (natural) qualities, such as heat and whiteness. First, Buridan highlights the fact that quantity is distinct from substance and quality (p. 89). Quantity is that "by which" (*qua*) the matter, substantial form, and qualities of a body, such as its color and temperature, are extended in three dimensions (p. 88). Next, he explains:

[J]ust as whiteness yields being white (*esse album*) formally (*formaliter*), so quantity, which is extension (*extensio*), yields being extended and having a certain size (*esse extensum et magnum*). And just as more whiteness in the same subject yields being whiter and more heat yields being hotter, so more quantity yields being bigger and being more extended. (QP I.8, p. 88)¹¹⁷

There are two things worth noting here. First, like whiteness, quantity is an accidental form.

Hence, Buridan uses the expression “*formaliter*” in connection with both whiteness and quantity.

Just as whiteness makes the substance in which it inheres white, so quantity makes the substance in which it inheres spatially extended. Second, quantity increases and decreases in a way that is analogous to the intension and remission of qualities.

Buridan explains what it is for qualities and quantity to increase and decrease in the passage immediately following the one quoted above:

Also, just as numerically the same thing that is at first white cannot become whiter except by the generation of whiteness in it [the subject] with the previous whiteness, and it cannot become less white except by the corruption of a part of whiteness, so the same thing of a certain size cannot become bigger without some generation of quantity with the pre-existing quantity and it cannot become smaller without the corruption of quantity.¹¹⁸

Here Buridan deploys his theory of the intension and remission of forms to explain changes in the size (specifically, the volume) of a body. In the passage just quoted, Buridan maintains that, just as some white thing cannot become whiter except by *the generation of a new part of whiteness with the pre-existing whiteness*, so some three-dimensional object cannot become more extended without *some generation of quantity in addition to the preexisting quantity*. Likewise,

¹¹⁷ *Constat bene quod causa huius reddi non potest, nisi ponamus dimensionem distinctam a materia et forma, a caliditate et frigiditate et huiusmodi qualitatibus qua praedicta omnia sint extensa, sicut uno motu, quem vocamus localem, subiectum cum omnibus sibi inhaerentibus movetur. Sed huiusmodi dimensionem ponendo nos possumus tutum salvare. Dicimus enim quod, sicut albedo dat esse album formaliter, sic magnitudo, quae est extensio, dat esse extensum et magnum. Et sicut in eodem subiectum plus de albedine dat esse albius et plus de caliditate calidius, ita plus de magnitudine maius et extensius.* (QP I.8, pp. 88-89)

¹¹⁸ *Ideo etiam sicut idem prius album non potest fieri albius nisi per generationem albedinis in eo cum albedine precedente, nec fieri minus album nisi per corruptionem partis albedinis, ita idem existens magnum non potest fieri maius sine aliqua generatione magnitudinis cum magnitudine preexistente nec fieri minus sine corruptione magnitudinis.* (QP I.8, pp. 88-89)

just as some white thing cannot become less white except “by the corruption of a part of whiteness,” so some three-dimensional object cannot become less extended without the corruption of some quantity. This is why just a few lines later, Buridan says that “the generation of a part of quantity (*generatio partialis magnitudinis*)” and the corruption of a part of quantity are rarefaction and condensation proper, as defined in the previous chapter.¹¹⁹

To understand what exactly Buridan thinks happens when a substance, say, gets hotter or a body rarefies we need to look at his fuller treatment of this topic in QP III.3-5. Henceforth, I shall focus on quantitative and qualitative *increases*, e.g. rarefaction and intension, only, to ease exposition. In Buridan’s view, both phenomena occur in virtue of an increase in the number of parts of the (accidental) form involved: extension in the case of rarefaction; and of some quality, such as heat, in the case of intension. For example, if I heat a pot of water, the water inside the pot rarefies and it comes to increase in volume in virtue of the fact that its form of quantity acquires more “gradual parts,” or degrees (as I explain below), just as the water becomes hotter in virtue of the fact that its form of heat acquires more degrees. So, at any point during rarefaction, what accounts for the body’s volume is in the thing, namely, the accidental form of quantity, having a certain number of parts (or degrees).

¹¹⁹ *Modo ultra dicimus quod in subiectis ad hoc habilibus, sicut ad calefactionem consequitur naturaliter generatio levitatis et ad frigectionem corruptio levitatis et generatio gravitatis, sic etiam ad huiusmodi calefactionem sequitur naturaliter generatio partialis magnitudinis et ad frigectionem corruptio. Et credo quod hoc sit rarefactio et condensatio. Raritas enim nihil aliud est in materialibus quam in pauca materia multa magnitudo, et densitas est in multa materia pauca magnitudo. Et dicimus ultra quod de huiusmodi magnitudine non potest aliquid ita notabile generari vel corrumpi per compressionem vel tractionem sicut per calefactionem et frigectionem, sicut nec etiam de gravitate et levitate. Et sic apparet causa et ratio praedictorum posita sic magnitudine distincta a substantia et qualitate. (QP I.8, pp. 88-89)*

In QP III.4, Buridan defends a theory of intension of qualities known at the time as the “addition-of-part-to-part theory” (Sylla, Guide to the Text, p. LXXVI).¹²⁰ This view is first developed by John Duns Scotus in his commentaries on Peter Lombard’s *Sentences*, Book I, d. 17, dealing with the increase of *caritas* in the human soul (ibid., p. LXXIX). It is one of the two main theories of the intension of qualities, and it is supported by Ockham as well. This “addition” view contrasts with the so-called “succession of forms” theory, defended by Walter Burley (ibid., p. LXIII). In QP Buridan attacks Burley’s position. However, in what follows I shall focus on Buridan’s positive account.

QP III.4 investigates whether in qualitative change, or alteration, “the quality with respect to which there is alteration, is acquired all at once (*tota simul*) or part after part (*partem post partem*)” (ibid., p. LXXVI). Buridan focuses on the example of calefaction. His answer to the question is twofold: first, he argues that “in calefaction something of heat (*aliquid caliditatis*) is acquired earlier and something of heat is acquired later in the same part of the same subject” (Sylla transl., p. LXXVIII); second, he maintains that “a degree of heat is not something different from heat”; rather, “in calefaction, that which is acquired first and that which is acquired later are called degrees of heat” (ibid., p. LXXIX).

To begin with, Buridan clarifies that a quality is “divisible” in two ways (QP III.4, p. 38). In the first way, a quality is divisible “according to the quantitative division of the *subject*” (emphasis mine; ibid.). As a result of this kind of (quantitative) division, a material substance, which is the subject in question, is composed of “quantitative parts” (*partes quantitativae*),

¹²⁰ In this respect, Buridan is in line with Ockham. However, Buridan and Ockham disagree when it comes to some of the details of their “addition” theories of the intension of forms, such as their views of the ontological status of the parts of forms and the metaphysical relation between an accidental form and its parts, or degrees. This theory was first developed by John Duns Scotus in a theological context, in his commentaries on Peter Lombard’s *Sentences* (Sylla, p. LXXXIII).

namely, parts that are distinct in location and position, and do not spatially overlap (*ibid.*). In this sense, when (say) fire heats a pot of water, a part that is closer to the fire becomes warmer before one that is further away from it (QP III.4, p. 38).

Second, and most importantly, a quality is “divisible into degrees [*partes graduales*] that exist at the same time in the same subject without any difference of position, and according to which, a subject is said more of this sort (*magis tale*) and less of that sort (*minus tale*)” (QP III.4, p. 39). It is in this sense of part that “one [part] is first acquired, then another, and another” and “in this way the subject is continuously made (*efficitur*) more such-and-such” (p. 39). So: when the water warms up, numerically the same (quantitative) parts of water get warmer, one after the other, continuously, starting from the one closest to the fire to the one further away from it. And this occurs in such a way that each of its parts acquires several degrees of heat, all co-located in one and the same subject.

Buridan holds that these degrees of heat are not “*res*” distinct from heat. Rather, Buridan describes them as “*aliquid caliditatis*” (QP III.4, p. 42). Buridan thinks that, when a body is heated continuously, each of its quantitative parts acquires a *new* degree of heat now, and a new degree of heat later, so that multiple degrees of heat are added to one and the same part of the body undergoing heating (QP III.4, p. 41). Buridan argues that this is the case because one and the same subject cannot change in temperature (in this case, get hotter) “except in virtue of some disposition that did not exist before but that exists afterwards” (*ibid.*). Yet Buridan maintains that a degree of heat is not some entity distinct from heat (p. 42). Throughout the entire process of heating, the form of heat of the body undergoing the change is “one in number and in essence” (*una numero et essentia caliditatis*) (p. 43). Specifically, during the change, heat is one “not by the unity of indivisibility, but by the unity of continuity” in virtue of the succession of part after

part (p. 43). Buridan explains, “heat remains one more truly [than a river], because a part that is acquired at first remains with a part that is acquired later... and from them one whole heat is made (*fit ex eis una totalis caliditas*)” (p. 43).

Based on Buridan’s (addition) theory of intension of forms, we can reconstruct his theory of rarefaction as well. When a body rarefies, its form of quantity increases in this sense: each of the body’s spatially distinct (quantitative) parts acquires new “degrees” of quantity continuously, and each “degree” of quantity makes that part of the body in which it inheres more extended, just as each degree of heat makes that part of the body in which it inheres hotter. Moreover, as in the case of heat, these “degrees” of quantity are not themselves *res* distinct from quantity; rather, they make one quantity in number and essence.

Section II: Meta-ontology of Quantity

Like whiteness and heat, quantity is what is usually referred to as a *real* accident. A real accident is an accident that is a *res*, using ‘*res*’ as a technical term and as it was commonly used starting in the fourteenth century. By ‘*res*’ I mean a genuine entity, an entity in its own right, which is really different from any other *res*, and can be separated (by God) from it.¹²¹ As such, quantity has the same ontological status of substance.¹²²

Buridan discusses this issue more fully in his commentary on Aristotle’s *Metaphysics*, Book IV.¹²³ In question six, Buridan inquires whether ‘being’ is said of substance and accidents

¹²¹ Cf. Stephen Menn, “The Greatest Stumbling Block: Descartes’ Denial of Real Qualities,” In *Descartes and His Contemporaries: Meditations, Objections, and Replies*, edited by Roger Ariew and Marjorie Grene (University of Chicago Press, 1995), p. 184; and Marleen Rozemond, *Descartes’s Dualism* (Harvard University Press, 1998), p. 122.

¹²² But: cf. my previous discussion ad quantity (and heat) and degrees. Think about the kind of unity a material substance v. an accidental form.

¹²³ Johannes Buridanus, *Kommentar zur Aristotelischen Metaphysik = In metaphysicam Aristotelis quaestiones*. (Minerva, 1964). Henceforth, I shall refer to this work as ‘IM.’ All translations are mine.

univocally, that is, according to the same concept.¹²⁴ His answer is *positive*: an accident is a being in the same sense that a substance is a being, that is, as a being in its own right, which can (and does) subsist on its own. Interestingly, Buridan distinguishes his solution from Aristotle's account of accidental being. In fact, Buridan says that "Aristotle's opinion on accidents differs greatly from the one that our faith posits," and, for this reason, Buridan finds this question "very difficult."¹²⁵

On Buridan's interpretation, Aristotle thinks that 'being' is said of substance and accidents, according to different, albeit related, concepts. On the one hand, a substance, such as a man or a donkey, is a being, "absolutely speaking" (IM IV.6, f.17). On the other hand, an accident, such as whiteness or blackness, is "something" (*aliquid*) by attribution to substance, "since the concept of an accident is explained through the concept of a substance" (ibid.). For "being-white is something-being-white" and "being-large is something-being-large" (ibid.). Hence, 'being' is said of substance and accident *analogously*: although 'being' is said of substance and accidents according to *different* concepts, these concepts are related in such a way that one is ascribed to the other.¹²⁶

However, Buridan holds that substance and accident are called beings in the same sense. That is, like substances, accidents are beings, absolutely speaking (IM IV.6, f. 17). For faith teaches that accidents, such as whiteness, can subsist in themselves, without inhering in anything else. It is worth quoting Buridan's argument in its entirety:

¹²⁴ "Sixth, it is asked whether this name, 'being,' signifies substances and accidents according to one *ratio* or according to one concept" [*Queritur sexto utrum hoc nomen ens significet substantias et accidentia secundum unam rationem sive secundum unum conceptum*] (IM IV.6, f.16v).

¹²⁵ "*Ista questio est iudicio meo valde difficilis propter hoc ut puto Aristotelis aliter valde opinatus est de accidentibus quam fides nostra ponit*" (IM IV.6, f.16v).

¹²⁶ Cf. Buridan, *Quaestiones in Praedicamenta* (Munich, 1983), q. 1. Here he defines analogy as follows. A term is analogous is one which "signifies several things according to different concepts"; yet "one concept ... is attributed [*habet attributionem*] to another concept" (p. 5).

Now, we must consider how we should answer to the question at issue by positing what we hold by faith. Therefore, I say that by faith we believe that, through the power of God, accidents can be separated from substance and can be conserved separately, without a substance thus acting as the subject: whereby we say that [the accidents] in this way subsist without a subject in the sacrament of the altar. If, therefore, we posit that whiteness subsists in itself [*per se*] thus, without inhering in any subject, then it is manifest that whiteness is clearly a being and is truly [*vere*] something. Also, from this it is evident that the concept from which we take the name ‘whiteness’ is as simple, without any connotation, as ‘God’ or any substantial term Therefore, this name ‘being’ or this name ‘something’ is said of whiteness equally as simply and in accordance with an equally simple concept as it is said of a stone and a donkey.¹²⁷

This is a remarkable passage: for here Buridan draws out the full (ontological) implications of the doctrine of the Eucharist. Buridan takes this doctrine as his starting point. As a result of it, he is led to conclude that (at least some) accidents, such as whiteness and quantity, are genuine entities, entities in their own right, just as substances are.

Consider Oresme as a contrast case. (See Part III below for more detail.) On the one hand, he agrees with Buridan that quantity is intrinsic to bodies. On the other hand, he holds that quantity is a *modus rei*, a thing’s (specifically, a substance’s) way of being. As such, quantity exists in some lesser way than a substance. Thus, participants in this debate (on quantity and other accidents) seem to conflate two issues: (a) what entity (whether a form, a *modus rei*, or something else) is extension; and (b) how this entity exists, whether it exists fully, as substance, or in some lesser way. (b) is a meta-ontological question.

¹²⁷ *Nunc videndum est quomodo respondendum est ad questionem motam ponendo ea quae posuimus ex fide. Dico ergo quod nos tenemus ex fide quod per potentiam dei accidentia possunt separari a substantia et separatim consevari sine substantia sic subiecta: unde dicimus quod sic sine subiecto subsistent in sacramento altaris. Si igitur ponamus quod albedo sic per se subsistat absque hoc quod alicui subiecto inhereat: tunc manifestum est quod illa albedo manifeste est ens et vere est aliquid et etiam ex hoc manifestum est quod conceptus a quo sumitur hoc nomen albedo est ita simplex sine aliqua connotatione sicut deus vel aliquis terminus substantialis et sic si de illo termino albedo predicaretur hoc nomen ens vel hoc nomen aliquid non oportet quod de eo predicetur secundum aliquam attributionem ad substantiam subiectam vel ad aliquem terminum substantialem quia sine substantia subiecta ipsa est ens et aliquid et non minus ipsa est ens vel aliquid quando inheret quam si subiectum esset ablatum: ideo hoc nomen ens vel hoc nomen aliquid eque simpliciter et secundum conceptum eque simplicem dicitur de albedine sicut dicitur de lapide et de asino (IM IV.6, f. 17).*

Section III – One More Argument for the Intrinsicity of Quantity

On my interpretation, Buridan thinks that quantity is an intrinsic, accidental property of a material substance. It is that in virtue of which a material substance has a determinate volume. (Note that volume is a *variable* feature of a body for Scholastic thinkers.) Moreover, Buridan holds that quantity is a so-called real accident, as I explained above. So, Buridan is a strong realist about quantity.

Now, to say that, for Buridan, extension is an intrinsic property of material substances (or bodies) amounts to saying that a body has a given volume solely in virtue of something about (or in) the thing, and nothing else. Contrast Ockham here, according to whom a body has a given volume in virtue of two facts: (i) a substance's having really distinct parts; and (ii) some external agent causing such parts to be at a certain distance from one another. (I explained Ockham's view in Chapter 1 above.)

In QP I.8, Buridan offers a short, so far overlooked, argument in support of his realism about quantity (2015 ed, p. 90). Buridan's argument goes as follows. Consider a body that is one foot long. Suppose that God destroys all bodies extrinsic to it and rarefies it until it is two feet long. "It is clear," Buridan contends, "that it [the body] is disposed (*se habet*) in one way at first and in another way afterwards; but not in relation to something extrinsic; so *intrinsically*" (emphasis mine; my translation; QP I.8, 2015 ed, p. 90).¹²⁸ The body is one foot long before rarefaction; and it is two feet long after God rarefies it. But being-one-foot-long and being-two-foot-long are two different "dispositions," specifically, two different extensions. And such

¹²⁸ *Conclusio nostra principalis potest sic persuaderi aliquibus aliis rationibus. Sit enim corpus pedale et omnia corpora sibi extrinseca sint annihilata et rarefiat per potentiam divinam, donec sit bipedale. Constat quod alio et alio modo se habet prius et posterius; et non ad aliquod extrinsecum; igitur **intrinsece**. Et istos modos ex parte rei alios ab invicem vocemus magnitudines, cum nos ponamus quod non sit prius et posterius alia materia vel alia forma substantialis vel alia caliditas aut frigiditas et sic de aliis (QP I.8).*

dispositions are *in* the body itself: they are “*ex parte rei*,” to use Buridan’s locution. Thus, the body is one foot long (and then two feet long) in virtue of something (extension) that is in it, and nothing else outside of it, as this case shows, in which God has destroyed everything other than the body.

By contrast, Ockham seems to hold that a body’s extension is extrinsic to it: some external agent is to account for the fact that this body is extended a specific amount. In his commentary on Aristotle’s *Physics*, Ockham argues that a substance has really distinct parts by itself. (Buridan agrees with Ockham on this point, as I show below.) And, in order for these parts of substance to be at a certain distance from one another, and for the substance, as a whole, to have a certain extension, it suffices that some “extrinsic causes” make them be at such a distance, without postulating some thing (*res*) inhering in the material substance (*contra* Buridan).¹²⁹

Now, to say that extension is intrinsic, for Buridan, does not imply that extension is an essential or necessary feature of material substances. For God can separate extension from matter (and material substance), as Buridan explicitly mentions in QP I.8. He argues, “if magnitude [e.g. extension] were removed from matter by divine power, that matter would still have parts distinct from one another, but its parts would not be positioned either outside one another or inside one another, because the position that characterizes magnitude would be removed” (Robert Pasnau’s

¹²⁹ *Similiter ad hoc quod aliqua distent situ sufficit distinctio realis eorum cum causis extrinsecis potentibus facere ea distare.* (emphases mine; *Exp. Phys.* IV.17, OPh V, p. 182). And he repeats this same view in his *Summula*, book III: *Nec ad hoc quod pars substantiae distat a parte requiritur nisi partes substantiae et causae extrinsecae facientes eas distare. Et per consequens ad hoc quod distent non requiritur aliqua res inhaerens eis.* ((*Summula* III.12, OPh VI, p. 193).

translation; *Metaphysical Themes*, p. 295).¹³⁰ But what matters for my purposes here is that Buridan allows that matter can exist without being extended. So, on Buridan's view, extension is an accidental property of bodies, in the sense that it is a feature bodies can (by divine power) lack. In the next section, I turn to Oresme's theory of quantity.

¹³⁰ *Ad confirmationem dico quod remota magnitudine ab ipsa materia per potentiam divinam adhuc illa materia haberet partes alias ab invicem, sed non haberet partes extra invicem nec intra invicem situatiter quia ablatu esset situs, qui est ratione magnitudinis.* (Buridan, *Quest. Phys.* I.8, p. 91)

PART III: ORESME ON QUANTITY AS A MODE OF SUBSTANCE

CHAPTER 5

ORESME ON THE VARIABILITY AND INTRINSICALITY OF QUANTITY

My aim in this chapter is to reconstruct Oresme's account of quantity as a mode of substance and his key philosophical considerations in support of it. Overall, Oresme's theory of quantity consists of two key metaphysical claims: (1) like all other accidents of substance, quantity is a "mode" (*modus*) of a *res* (namely, substance); as such it is neither a real accident, as Buridan thinks, nor is it reducible to material substance (plus the action of some extrinsic agent) as Ockham holds. Rather, it is a "condition" of substance (*condicio substantiae*). Specifically, it is *a substance's having a particular volume at a particular time*, just as a substance's quality is its being qualified a particular way, e.g. the wax's being a particular shade of yellow now. (2) As a mode of substance, quantity exists in a diminished way; so, Oresme is an ontological pluralist. In this chapter, I focus on Oresme's theory of quantity, as set forth in his Questions on Aristotle's Physics (QP) IV.14 and 15.¹³¹ Here I highlight the variability and intrinsicity of quantity, on his view. In the next chapter, I examine Oresme's ontology and meta-ontology of accidents, more generally; I then draw the implications of his metaphysics of accidents for the relation between quantity and material substance.

Before I proceed to reconstruct Oresme's ontology of quantity, I would like to highlight some unique features of Oresme's account. First, on my reading, Oresme's view of quantity as a mode of substance does the best job among the three representative views examined here at

¹³¹ Nicole Oresme, *Questiones Super Physicam (Books I-VIII)*, edited by Stefano Caroti, Jean Celeyrette, Stefan Kirschner, and Edmond Mazet (Leiden 2013). This is the only work in which Oresme *fully* develops and consistently appeals to his view of accidents as "modes of things." (Cf. Caroti (2000).) This is an early work, dated before 1347, and likely composed at the time Oresme taught at the University of Paris, after earning his Master of Arts. (Cf. Burton (2007), pp. 5-17.) The view of accidents as modes of things, as set forth by John of Mirecourt, a theology master at the University of Paris who was contemporary with Oresme, was condemned in 1347. (See Pasnau 2011, pp. 408-412.) Oresme thus steps back from this view after that date and doesn't discuss it in his later works.

accounting for both the variability and intrinsicality of extension. (Indeed, this is why Oresme himself is attracted to this view of quantity and accidents.) Recall that Ockham struggles with both. By denying that quantity is really distinct from substance, he needs to explain how one and the same substance can have different extensions at different times due to C/R, strictly understood. So, he has to appeal to some extrinsic agent (*contra* Aristotle). Moreover, even though Buridan's realism about quantity easily accounts for the variability of extension, it has limits in connection with the intrinsicality of extension – precisely because of the strong ontological status of quantity. By contrast, Oresme strikes a middle ground such that quantity *qua* mode of substance is neither reducible to merely substance nor really distinct from it and, thereby, a body's extension is both a variable and intrinsic feature of it.

Second, in QP IV.14-15, Oresme clarifies the relationship between local motion and condensation. Like Buridan, Oresme thinks that when a body condenses, strictly speaking, its integral parts get smaller; as a result, by Oresme's (and many of his contemporaries') understanding of distance and proximity, some of the parts of the body get closer to one another. (For: given any two parts between which lies a third one, the distance between them decreases as the part lying between them reduces in volume.) This is how condensation and local motion are related. It is true that a body cannot condense without the local motion of some of its parts, namely, some of its parts' getting closer to one another. However, such local motion occurs *as a result of* all of the parts' getting smaller. In what follows, I first examine Oresme's theory of quantity as a mode of substance; next, I take a closer look at his theory of C/R.

Section I: Quantity as a Mode of Substance

Oresme sets forth his view of quantity as a “certain *condicio* of substance” in the context of his discussion of condensation and rarefaction. In QP IV.14, Oresme distinguishes two kinds of C/R, just as Buridan did (see my discussion in Chapter 3). He then argues that C/R, strictly understood, is possible. In QP IV.15, Oresme examines whether “a new quantity” is acquired in rarefaction and, similarly, whether the old quantity is lost in condensation (p. 521).¹³² Oresme considers three different answers to this question, depending on three different ways of distinguishing quantity from its subject.¹³³

According to the first view (**View 1**), “quantity is not some thing distinct from the thing that is quantified,” that is, substance (p. 522).¹³⁴ This view denies that quantity is a *res* really distinct from the material substance that’s quantified. This is what Ockham believes; specifically, what I call above his Anti-Realism about quantity. It is worth noting, though, that this claim *by itself* does not imply that there is *no* distinction whatsoever between a material substance and its quantity or that the two are numerically identical. In fact, Oresme himself denies that quantity is some entity (*res*), specifically a form, that is really distinct from the extended substance; yet he maintains that there is *some* distinction between the two. But, in this context, Oresme seems to understand View 1 as denying *any* distinction between quantity and material substance and as saying that quantity reduces to substance alone. For later he argues that View 1 is unable to account for the fact that, when a body condenses or rarefies, strictly speaking, one and the same

¹³² QP IV.15: *Consequenter queritur utrum in rarefactione acquiratur nova quantitas, et similiter in condensatione deperdatur precedens.* (p. 521)

¹³³ *Secundo, sciendum quod in generali triplex est modus respondendi ad questionem, secundum triplicem viam <de> distinctione quantitatis a subiecto* (p. 522).

¹³⁴ *quantitas non est aliqua res distincta a re quanta* (p. 522)

substance has different volumes at different times. (As I explain in Chapter 1 Ockham does not hold this view, for example.¹³⁵)

According to the second view (**View 2**), quantity is some “*unum hoc aliquid*” (this is the Latin translation for the Aristotelian Greek expression *tode ti*) distinct from substance. (p. 522). Specifically, it is a form that can (by divine power) exist on its own without (inhering in) substance.¹³⁶ This is Buridan’s realism about quantity, according to which: first, quantity is a *res* distinct from the substance that is quantified; second, it is a form, which would continue to exist even without inhering in a substance; and, third, ‘being’ is said univocally of it and substance. It’s worth noting that, for Oresme, what matters here is not merely the fact that quantity is distinct from substance; or even that it is a form; but that it exists as substance does; that is, its meta-ontological status.

The third view (**View 3**) is an intermediary position between the first two. On the one hand, quantity is not some form, *really* distinct and separable from the substance in which it inheres, as View 2 holds. On the other hand, quantity is distinct from the substance in which it inheres in some way: it is a “mode” or “condition” of that substance. And, even though this mode cannot exist without this substance, this substance can exist without this mode. Oresme introduces this view as “Aristotle’s”; he explains that on this view “quantity is neither substance

¹³⁵ Specifically: in Chapter 3 I argue that even though Ockham is an anti-realist about quantity, he is not a reductionist about quantity in the sense that quantity reduces to substance alone. Rather, on Ockham’s view, quantity as that in virtue of which a material substance has a determinate volume is twofold: (i) the material substance and its integral parts; (ii) an extrinsic agent causing such parts to be spatially arranged in a determinate way.

¹³⁶ “*una forma, que adhuc esset, si per quamcumque potentiam substantia tolleretur, ita quod isti ymaginantur ac si ‘res’ et ‘ens’ dicere<n>tur univoce de substantia et de tali accidente*” (p. 522).

itself nor some such form [as he explained in the previous passage], but it is a particular condition of substance, e.g., that substance's having a volume of three square feet.¹³⁷

This passage is important for (i) it distinguishes this third account from the previous two; and (ii) it offers a positive characterization of this third one. The way Oresme describes view 1 and view 2 is telling. Note that he describes view 1 here as saying that “quantity is substance itself” (*quantitas est ipsa substantia*); and in describing view 2 he highlights the fact that, on this account, quantity is “a form of this kind” (*aliqua forma talis*), namely, a form that exists as substances do. So, by distinguishing view 3 from view 1 and view 2 in this way, Oresme draws attention to the key features of quantity he finds problematic in each view and which view 3 lacks. On view 3, quantity is distinct from substance, yet it cannot exist independently of substance. As I explain in the next chapter, this leads Oresme to hold that quantity as a mode of substance exists in a lesser way than substances do. In what follows I focus on the key considerations motivating his account.

To support his interpretation of Aristotle, Oresme cites *Physics* IV.9, 217a33-b5, where Aristotle considers the relationship between a subject and a quality, e.g. between a circle and its circularity. Oresme maintains, “Now, we must not think that circularity is a form that inheres in the circle and [we must not think] that Aristotle would agree that the circle and its circularity are the same either, or that a straight line and its straightness [are the same]” (p. 522). Rather, Oresme explains, Aristotle holds that “being straight and being curved are different” (p. 523). “Therefore,” Oresme concludes, “as it was said elsewhere, ‘being’ is said equivocally of that

¹³⁷ *Tertia via est Aristotelis quod quantitas non est ipsa substantia nec aliqua forma talis* [that is, a form that exists in the same way in which a substance does], *sed est quedam condicio substantie, scilicet, ipsam esse quantam ut tricubitam.*

which truly is, namely of substance, and of such accidental being” (p. 523).¹³⁸ In this last sentence, Oresme alludes to his semantic and metaphysical views of being, which will be the focus of my next chapter. Here I’d like to focus on his reconstruction and analysis of the relationship between a circle and its circularity, on his reading of Aristotle’s *Physics* IV.9.

First, Oresme draws attention to the fact that, on Aristotle’s view, (i) circularity is not a form inhering in the circle; yet (ii) a circle and its circularity are not numerically the same. Second, Oresme highlights that one and the same line can at first be curved and then be straight. Thus, it is not only the case that a circle is not numerically the same as its being curved, but also that being curved and being straight are distinct. Oresme’s somewhat condensed reasoning here points to the key drawback of view 1: its inability to account for changes in quantity due to C/R, strictly understood, as I explain more below. Finally, Oresme distinguishes the being of substance from the being of an accident, such as a quality. As I explain in the next chapter, ‘being’ is said equivocally (more specifically, analogously) of substance and accidents: it is said primarily of substance and secondarily of accidents, such as qualities (and quantities). This is the main drawback of view 2, according to which (at least some of) the accidents of a substance are forms that have the same ontological status as substances. In connection to quantity, as I discuss more below, this also seems to make the relationship between substance and quantity as much more like one between two substances. So, View 2 misses the mark in two important ways, on Oresme’s view: first, it (incorrectly) conceives of *accidents as substances*; second, as a result, it also (incorrectly) conceives of the relationship between them.

¹³⁸ “*Modo non est ymaginandum quod circuitas sit una forma inheres circulo, nec etiam Aristotelis concederet quod idem esset circulus et circuitas, vel rectitudo et recta, in quibus concedit quod aliud est esse rectum et aliud est esse curvum. Et ideo, ut alias dictum est, ens dicitur equivoce de illo quod vere est, scilicet de substantia, et de tali esse accidentalī*” (p. 523).

Oresme thinks that what he describes as Aristotle's view, namely that "continuous quantity is nothing other than a substance's being extended this much or that much (*substantia esse tantam vel tantam*) is the most "plausible" (*rationalis*) view of quantity. On this view, when a body rarefies, it acquires new quantity continuously [*in rarefactione continua est nova quantitas*] (p. 525).¹³⁹ To "prove" (*probatur*) his theory of C/R (just described), first, Oresme appeals to Aristotle's analogy between the curvature of a circle and rarefaction. When a circle is curved, there is a new curve continuously, *quia semper habet aliud esse curvum*. Similarly, when a body rarefies, a body is extended differently continuously. For: to be one-foot is different than being two-feet, etc. Here Oresme draws attention to the fact that when an object changes shape or volume, at any point during the change, the object has a different shape or volume. So, Oresme thinks that in cases of qualitative and quantitative changes, an object acquires a new quality or a new quantity continuously. Second, Oresme highlights the *intrinsic* nature of such changes. Again, Oresme cites Aristotle's *Physics* IV.9 (specifically, 217a21-b10) to support his point: just as a subject changes from white to black and from less hot to hotter in such a way that a new heat is educed from the potentiality of matter, and not from something extrinsic to it; the same applies to rarefaction.¹⁴⁰ Third, and lastly, Oresme explains that, even though in any instant

¹³⁹ This is Oresme's succession theory of modes. For a careful reconstruction of this view, see: Stephen Kirschner, "Oresme on Intension and Remission of Qualities in His Commentary on Aristotle's *Physics*," *Vivarium* 38 (2000), pp. 255-74.

¹⁴⁰ Aristotle, *Physics* IV.9, 217a27-7b21: "The same matter also serves for both a large and a small body. This is evident; for when air is produced from water, the same matter has become something different, not by acquiring an addition to it, but has become actually what it was potentially, and, again, water is produced from air in the same way, the change being sometimes from smallness to greatness, and sometimes from greatness to smallness. Similarly, therefore, if air which is large in extent comes to have a smaller volume, or becomes greater from being smaller, it is the matter which is potentially both that comes to be each of the two. For as the same matter becomes hot from being cold, and cold from being hot, because it was potentially both, so too from hot it can become more hot, though nothing in the matter has become hot that was not hot when the thing was less hot; just as, if the arc or curve of a greater circle becomes that of a smaller, whether it remains the same or becomes a different curve, convexity has not come to exist in anything that was not convex but straight (for differences of degree do not depend on an intermission of the quality); nor can we get any portion of a flame, in which both heat and whiteness are not present. So too, then, is the earlier heat related to the later. So that the greatness and smallness, also, of the sensible

a body that is rarefied has a new volume (*esse quantum*), it does not follow from this that infinitely many *res* are generated here. For the being that is “generated” in every instant is a mode of a *res* and not a *res* itself. Thus, the kind of generation at issue here is not generation, strictly speaking, as in the case of substantial change, but generation, broadly understood (pp. 525-26).

Following Kirschner (2000), I’d like to focus on Oresme’s appeal to the analogy between circle/curve and extended body/extension; as well as between the curvature of a circle and C/R. This helps us understand the issues with views 1 and 2; as well as the strengths of view 3.¹⁴¹ First, it seems that the problem with view 1 consists in this. When a body rarefies, *strictly speaking*, its substance remains (numerically) the same. Yet it changes its extension. Thus, the rarefied body’s extension (both before and after rarefaction) is distinct from its substance. It is worth noting that this problem does not arise in connection with rarefaction, broadly understood. For, in this case, the body comes to occupy a bigger place because of the addition of material parts from the outside. The following hold: (1) The body’s substance remained the same, but so did the body’s extension; (2) The overall, apparent volume of the body changed, but this is due to the addition of some *other* substance, from the outside. Second, the problem with view 2 seems to lie in identifying ‘being disposed in such-and-such a way’ with a form inhering in the substance and *having the strong ontological status* of substance. But why? Here the problem seems to lie in thinking of such form as *res*, perhaps because as such it would count as *extrinsic*

volume are extended, not by the matter’s acquiring anything new, but because the matter is potentially matter for both states; so that the same thing is dense and rare, and the two qualities have one matter. The dense is heavy, and the rare is light. Again, as the arc of a circle when contracted into a smaller space does not acquire a new part which is convex, but what was there has been contracted; and as any part of fire that one takes will be hot; so, too, it is all a question of contraction and expansion of the same matter. (in *The Basic Works of Aristotle; Physica* translated by R. P. Hardie and R. K. Gaye; pp. 287-288)

¹⁴¹ Kirschner (2000), pp. 265-66.

to the matter (and form) rather than *intrinsic* to it and deduced from it. So, View 3, that is Oresme's is able to account for both the variability and intrinsicity of extension, unlike Views 1 and 2, respectively.

Taking Stock

Thus, to sum up: Oresme rejects both reductionism and (strong) realism about quantity. He denies that quantity is reduced to material substance. He also denies that quantity is an accidental form inhering in material substance; and (as such) existing in its own right, just as substances do. Rather, Oresme holds that quantity is "a certain condition of substance" (*quaedam condicio substantie*), such as "*ipsam esse quantam ut tricubitam*" (p. 522). Why does Oresme think this? For: on the one hand, a reductionist view of quantity fails to explain how one and the same substance can change its volume when it condenses or rarefies, strictly speaking. On the other hand, a (strongly) realist view of quantity ascribes to an accident the same ontological status of substance, and this undermines the fundamental distinction between substances and accidents as well as between substantial and accidental change, in Aristotle's view.

Section II: C/R: a closer look

In QP IV.14, Oresme examines "whether something can be condensed" (p. 514). He holds that "it is possible for something to be condensed" (p. 514). Next, he explains what condensation is and how it is possible. Oresme holds that there are two kinds of condensation: broadly speaking (*grosse et improprie*), "*per exitum aliquarum partium*" just as we say that wool is condensed by the exit of air when it is compressed (p. 514). This corresponds to Buridan's notion of condensation, broadly understood. Strictly speaking (*proprie*), condensation is that which occurs

sine tali exitu, just as we say that air or water is condensed. This corresponds to Buridan's notion of condensation, strictly understood.

In this question, Oresme says he is concerned with *densitas et condensatio*, strictly speaking (*in proposito capitur densitas et condensatio proprie*). Specifically, Oresme describes 'densum' as "that in which there are more (*plures*) parts of matter under a smaller quantity" and 'rarum' as "that in which fewer [parts of matter] are under a greater quantity." Oresme maintains that "from this it is clear that rare and dense are relative, just as Aristotle says about big and small, as it's clear in the *Categories*" (p. 514). Now, Oresme raises two worries: (1) "If matter comes to be under (*sub*) a smaller quantity, it follows that the matter itself becomes smaller, and therefore there is less matter under that small quantity than there was before under the greater one. And one could say something similar about rarefaction" (p. 514); (2) "since there are infinitely many parts of matter, there are no more parts of matter under quantity than under another" (p. 514)

In answer to the first worry, Oresme explains that something is denser when there is more matter "*essentialiter*" and not "*extensive*" under a smaller quantity; "in such a way that, when some matter comes to be under a larger quantity and rarefies, it is not the case that (some) parts of matter "leave" (*recedunt*) and that some parts of matter "come" (*adveniunt*) (p. 515). In answer to the second worry, Oresme explains that 'parts' in the definition of 'dense,' are not to be understood '*quantitative*' but '*quoad essentiam*.' He explains this notion as follows: "That is: suppose *a* is a dense body while *b* is a rare body of equal extension [as *a*]; then, if *a* were to become as rare as *b*, all the [parts] that were under the same extension as *b* now are under a greater extension" (p. 515). It seems that the notion of "essential parts" of matter points to weight or mass, rather than extension in space. As such, a dense body will have more mass than a rare

body, even though they have the same volume. For example, even though a cup of milk and a cup of air have the same volume, a cup of milk is denser; there is more matter in one cup of milk than in one cup of air. So: Oresme maintains that “it is possible for something to condense” in the sense explained above.

Next Oresme raises some interesting objections. The first objection goes as follows. If condensation were as Oresme describes, then it would follow that two bodies would be in the same place at the same time. For: take a body, consisting of two halves *ab*, and condense it to half its volume; then *a* and *b* would be precisely in the place where (say) *b* was before; and since *a* would be in the place where *b* was before, then *a* and *b* would be co-located. Oresme answers thus. He denies that *a* would be where *b* was. He holds that even though *a* and *b* are where *b* was before, still they do not penetrate each other in that place, for it is not the case that: *a* occupies that whole place; and *b* occupies that whole place. For *a* now occupies a place that is smaller than the one it was before. So, it seems that both *a* and *b* are now smaller rather than of same size as before and overlapping.¹⁴²

Another interesting objection for my purposes is the third objection. It goes as follows: “it is impossible for the parts of some body to lie closer than they are, thus it is impossible for that body to be condensed” (p. 519). Now, in a dense body, the parts lie closer; yet the parts that are contiguous to one another cannot get closer to each other, except if one were to penetrate the other. Oresme replies that a dense body is not one whose parts lie closer; rather, a dense body is one in which more matter (essentially) is under a smaller quantity (e.g. extension). Oresme concedes that it follows from this notion of a condensed body that when a body condenses, all of

¹⁴² See the “Appendix” for a similar issue in connection with an argument, centered on C/R, that Ockham sets forth in the context of the sacrament of the Eucharist in his *Reportatio* IV, q. 6.

its parts get smaller and (come to) occupy a smaller space. As a result, any two parts that are distant from each other in virtue of some third part (*partes mediate*) get closer to each other because the part between them is now smaller and so the distance between them is shorter too. By contrast, two contiguous parts (*partes immediate*) cannot get any closer (except by interpenetration) even though they may be smaller now. For example, consider a body composed of three contiguous equal parts, *a*, *b*, and *c*. When the body is condensed, all three parts are condensed as well. Even though *a* does not thereby lie closer to *b*; and *b* does not thereby lie closer to *c*, *a* does lie closer to *c* because of *b*'s being smaller.¹⁴³

Finally, Oresme clarifies the relationship between condensation and local motion on his view: *nulla fit condensatio sine motu locali, quia ibi fit appropinquatio partium* (p. 519). Here Oresme maintains that condensation cannot occur without local motion because, when a body condenses, some of its parts get closer together (as explained above). I find this way of describing the relation between condensation and local motion helpful. For: it is true to say that there is no condensation without local motion. However, the reason this is true is because the parts of matter themselves get smaller, so the distance between any two parts between which is another, is shortened. In other words, local motion of parts getting closer to each other is the result of the parts getting smaller. Matter (and parts thereof) contracting and expanding is what's basic, not matter and local motion.

¹⁴³ *quaecumque partes mediate sunt propinquius quam ante, quia pars inter eas est condensata et in minori loco. But partes immediate secundum se totas non sunt appropinquate licet <bene> secundum aliquas partes.* (p. 519)

CHAPTER 6

ORESME ON THE METAPHYSICS OF ACCIDENTS AND THE RELATION BETWEEN QUANTITY AND MATERIAL SUBSTANCE

The goal of this chapter is to reconstruct Oresme's ontology and meta-ontology of accidents, more generally. I then draw out the implications of these views for his theory of quantity and the relationship between quantity and material substance, in particular.

In QP I.5, Oresme articulates and defends his view of accidents as “modes of things” (*modi rerum*). On this view, an accident is not a genuine, full-fledged being; rather, it is merely “a condition or disposition of” such a being, namely, a substance (QP II.6, pp. 204-205).¹⁴⁴

Whereas substances exist “by themselves” (*per se*), accidents exist through substances (QP I.5, p. 34). For example, whiteness (*albedo*) just is something-being-white (*aliquid album esse*) (QP I.5, p. 35). Now, for Oresme, this doesn't mean that the being of an accident altogether reduces to (and is identical with) the being of a substance, as I mentioned in the previous chapter.

Although accidents lack some kind of being, i.e. *per se* being, they have being in some secondary and derivative way. Specifically, accidents enjoy a way of being that is distinct from, but essentially dependent upon, the being of substances.

Thus Oresme's view of accidents implies that there are (at least two) different ways of being. Following Kris McDaniel (2009, 2010a, 2010b) and Jason Turner (2010), I refer to this meta-ontological view as ontological pluralism (OP). The ontological pluralist holds that “what it is for an entity to *be* can differ across ontological categories” (McDaniel 2010a, p. 688). She not

¹⁴⁴ Here I use the expression ‘genuine being’ to translate Oresme's expression ‘*vere ens*,’ which literally means, “truly a being.” It's important to note that even though only substances count as “truly” beings, accidents do not lack reality altogether, on Oresme's view. I explain his (moderately realist) view of modes below.

only asks whether something exists or not but also *how* it exists (McDaniel 2010b, p. 628).¹⁴⁵ In particular, Oresme distinguishes (i) the way of being enjoyed by substances, e.g., absolute, genuine being, from (ii) the way of being enjoyed by accidents, e.g. derivative and, so to speak, “diminished” being.¹⁴⁶ The being of accidents is essentially dependent upon the being of substance. In this chapter, I aim to explicate Oresme’s view of modes, drawing special attention to the OP it implies.

This chapter is divided into two main parts. In Part I, I focus on Oresme’s account of accidents as “modes of things.” I begin by providing the immediate context for the introduction of this view in QP I.5: his *semantic* theory of the analogy of ‘being.’ Next, I examine the *metaphysical* views that underlie and explain this semantic account, focusing on the ontological status of accidents. In Part II, I discuss the type of ontological pluralism that Oresme’s theory of accidents implies. First, I provide a brief introduction of OP, as set forth by McDaniel. Second, I discuss how this account applies to Oresme’s view. Third, I contrast Oresme’s (nominalist) ontological pluralism to the (realist) *monism* of an earlier Parisian philosopher, Radulphus Brito (c. 1270 – c. 1320). Contrary to Oresme, Brito holds that there is only one way of being (*modus essendi*), common to all categorial beings. I thus aim to throw light on the ontological status of modes, on Oresme’s view. Finally, I shall return to Oresme’s theory of quantity and its essential dependence on substance.

Part I: Oresme on the Ontological Status of Accidents

¹⁴⁵ One might argue that the ontological monist too asks “how” things exist. As I explain in more detail in Part II below, the ontological pluralist asks *how* things exist so as to posit different ways of being.

¹⁴⁶ Cf. Thomas Aquinas, *In duodecim libros Metaphysicorum Aristotelis expositio*, edited by M. R Cathala and Raimondo M Spiazzi, (Marietti, 1971), Book IV, lesson 1, n. 543, p. 152.

I.1) Oresme on the Analogy of 'Being'

Oresme introduces his view of accidents in QP Book I, question 5, which asks “whether ‘being’ is univocal with respect to substance and accident” (p. 31).¹⁴⁷ This question is raised here, at the beginning of a commentary on Aristotle’s *Physics*, because of Aristotle’s remark in *Physics* I.2 that “being is said in many ways,” within the context of his rejection of Eleatic monism.¹⁴⁸ What matters for our purposes is that, because of this claim, *Physics* I becomes a *locus classicus* for Aristotelian commentators to discuss the problem of the unity of the notion of being.¹⁴⁹ But why does Oresme introduce and defend his (preferred) view of *accidents* here?

Because Oresme’s theory of accidents *explains* his semantic theory of ‘being.’ In this chapter, Oresme argues, first, that ‘being’ is said “principally” of substance and “less principally” of accident (QP I.5, p. 32). That is, ‘being’ is said of substance and accidents in an analogous way, by Oresme’s definition of analogy (QP I.5, p. 32).¹⁵⁰ Second, he shows that the analogy of ‘being,’ as he understands it, is *implied by* the ontological status of accidents. Thus, Oresme’s metaphysical views about the being of substance and accidents underlie and explain his semantic claims.¹⁵¹

¹⁴⁷ For the purpose of this chapter, I define equivocals and univocals as follows: an **equivocal term** is one which signifies several things according to different accounts (*rationes*), where ‘account’ (*ratio*) is taken as the definition or the concept corresponding to the name. A **univocal term** is one which signifies several things according to the same account, where ‘account’ is understood as the definition or the concept corresponding to the name. For a clear and detailed discussion of late medieval theories of univocation, equivocation, and analogy, see Ashworth (2008). I discuss Oresme’s account of equivocity and analogy, in particular, below.

¹⁴⁸ Cf. *Phys* I.2 185a20-b5. Also, cf. Donati (2003), p. 61.

¹⁴⁹ Cf. Donati (2003), *ibid.*

¹⁵⁰ Oresme defines an analogous term as one “which signifies one thing principally and truly and another thing less principally”; for example, ‘animal’ as said of a real and painted animal (emphasis mine; QP I.5, p. 32).

¹⁵¹ Oresme’s semantic theory of ‘being’ fundamentally depends on his metaphysical theory of accidents. If this is right, then my interpretation is the opposite of Mazet (2000). As I shall argue, it is precisely because accidents exist in a way that is different from, and essentially dependent upon, the way substances do, that ‘being’ is said of substance “primarily” and of accidents “secondarily.” By contrast, Mazet holds that Oresme’s view of accidents follows from his semantic views (Mazet 2000, pp. 85-89). I think Mazet too easily dismisses Oresme’s *metaphysical* considerations in support of the analogy of ‘being’ in QP I.5 (p. 35) as a mere appeal to authorities.

Let me begin by looking at Oresme’s semantic theory of the analogy of ‘being.’ Oresme claims that “‘being’ is said equivocally of substance and accident, taking ‘equivocal’ ... as analogous, in such a way that it is properly and truly said of substance, secondarily of accident” (p. 35).¹⁵² Let me carefully explain this central claim before I provide Oresme’s considerations in support of it. Oresme claims that the word ‘being’ signifies substance “properly and truly” and accident “secondarily” (ibid.). But if a term signifies one thing more principally than another, then it is analogous (p. 32).¹⁵³ Thus ‘being’ is analogous with respect to substance and accident. Since analogy is one type of equivocation, on Oresme’s view, ‘being’ in this case is also equivocal.¹⁵⁴ So, the key idea, which needs support and explanation, is that ‘being’ signifies one thing (i.e. substance) more principally than another (i.e. accident). Why is that the case?

Oresme explains: “that is said equivocally of accident which is not said of it according to the proper account [*secundum propriam rationem*], that is, the proper description or definition of the name [*descriptionem vel definitionem propriam quid nominis*]” (p. 35). Now, what is the “proper definition or description” of a name and why does Oresme say “description or definition”? It seems that the “proper account” of a name is the real definition (genus + difference) of that which the name signifies, at least when it is possible to provide such a definition. For example, the “proper account” of ‘animal’ is the Aristotelian definition of an

¹⁵² “*Tunc pono conclusiones. Prima est ista: quod ‘ens’ dicitur equivoce de substantia et accidente, capiendo ‘equivocum’ secundo modo pro analogo, ita quod proprie et vere dicitur de substantia, secund<ari>o de accidente*” (QP I.5, p. 35).

¹⁵³ Oresme explicitly says that “it *suffices* for one [term] to be analogous... that it signifies one thing more principally than another” (emphasis mine; p. 32).

¹⁵⁴ Following Boethius, Oresme divides equivocals into equivocals “by chance” (*a casu*) and equivocals “by deliberation” (*a consilio*) (QP I.5, p. 32). Chance equivocals are terms which signify different things according to accounts of the name which are just accidentally related. Consider, for example, the word ‘bank’ as said of the financial institution and the river bank. By contrast, a deliberate equivocal is a term which signifies different things according to accounts of that name which are *related* to one another, not merely “by chance.” Oresme identifies analogy with deliberate equivocation, in particular. For a detailed defense of this claim, see Mazet (2000), pp. 69-73.

animal, that is, “an animated sensible substance” (QP I.5, p. 33). But we can’t define substance and accidents, strictly speaking (genus + difference), since being is not a genus. Thus, in this case, the proper account is a “true description” of that which the name signifies instead. (I think this is why Oresme says that the case of ‘animal’ and ‘being’ are analogous but not “altogether similar” (QP I.5, p. 35).)

Now, the proper account of ‘being’ is the (true) description of substance. For: “if one asks what is a truly a being (*vere ens*), one answers that it is substance, just as if one asks what is an animal, one answers that it is an animated, sensible substance” (ibid.). Earlier Oresme says that “a substance is a thing [*res*] that exists *per se* and properly” (p. 34). Thus, the proper account (or definition) of ‘being’ is “a thing which exists *per se* and properly.” But, Oresme argues, such an account of ‘being’ does not pick out accidents. Thus, ‘being’ is said of accidents *equivocally*.

To illustrate, consider the picture of Tessie, my dog, I have on my desk. Suppose I point to it and say, “That’s an animal.”¹⁵⁵ Following Aristotle, Oresme defines an animal as “an animated, sensible substance.” But my *picture* of Tessie is not an animal in this sense. Thus, Oresme would say, ‘animal’ is not said of Tessie’s picture according to the “proper account” of that name. Rather, my dog’s picture is an *image* of an animal (as defined above). Hence, Oresme would argue, ‘animal’ is said of Tessie’s picture *equivocally*. But note that the (broader) account, by which it is right to say that my dog’s picture is an animal, is closely *related* to the “proper account” of animal, namely, “animated, sensible substance.” Thus, ‘animal’ is not said of

¹⁵⁵ This is a *standard example* in the literature on this topic, taken from Aristotle’s definition of homonyms (equivocals) in the opening lines of the *Categories*. Following Boethius’s translation of the *Categories*, Aristotle defines equivocals and univocals as follows: “Those that have only a name in common but a different account of their substance [*substantiae ratio*] in accordance with that name are said to be equivocals, e.g., ‘animal’ <in relation to> man and what is painted. Those that have both a name in common and the same analysis of their substance in accordance with that name are said to be univocals, e.g. ‘animal’ <in relation to> man, ox” (my translation; Aristoteles Latinus, I,1-5, *Categoriae vel Praedicamenta*, ed. L. Minio-Paluello, Leiden, 1961, p. 5).

Tessie's picture merely equivocally, but also analogously: it is said "principally" of a real animal and secondarily of a picture of an animal. Likewise, 'being' is said of accidents not only equivocally but also analogously. For the (broader) account of 'being' by which an accident is a being, e.g., "that which exists *through* substance," is closely related to the *proper* account of 'being,' namely, the "definition" of substance itself.

I.2) Oresme on Accidents as Modes of Substances

So far I have focused on semantic considerations. I will now address the metaphysical considerations that underlie Oresme's theory of the analogy of 'being.' The reason why 'being' does not signify accidents primarily is this: whereas a substance is a genuine being, or "that which truly is," "accidents are not beings except because they *belong to* a being" (emphasis mine; QP I.5, p. 35). Accidents "are said to be only because they are *accidental to* substance" (emphasis mine; *ibid.*).¹⁵⁶ For Oresme this implies that accidents "have no being (*essentiam*) of themselves (*de se*)" (*ibid.*) But what does this mean?

In his commentary on Aristotle's *De Anima* I.5, Oresme attributes a similar view to Aristotle, according to whom, Oresme says "an accident cannot be separated from substance not only with respect to its existence [*secundum existentiam*]... but also with respect to its quiddity [*secundum quidditatem*], because it does not properly have being [*esse*]" (my translation).¹⁵⁷ So, Oresme suggests, lacking proper being implies that an accident depends on its substance not only

¹⁵⁶ "*etiam <accidentia> non dicuntur esse nisi quia accidunt substantie, et ita nullam essentiam habent de se*" (p. 35).

¹⁵⁷ "*Et ideo ista via est longe ab opinione Aristotelis, quae fuit quod accidens non est separabile a substantia non solum secundum existentiam, ut glossant, sed etiam secundum quidditatem, quia non habet esse proprie*" (emphasis mine; Oresme 1995, p. 119). It's worth noting that Oresme seems to *endorse* this view here, even though he presents it as Aristotle's opinion. Cf. Pasnau 2011, pp. 411-12.

“with respect to its existence” but also “with respect to its quiddity” or essence. How are we to interpret this?

Aquinas’ (quasi-)definition of accidents might be helpful here. In his view, an accident is that “to whose nature [*cuius naturae*] it belongs to exist in something else.”¹⁵⁸ Aquinas uses this (more careful) phrasing instead of the simpler “that which is in something else” in order to accommodate the doctrine of the Eucharist, where, after consecration, the sensible qualities of the bread and wine remain without inhering in a (substantial) subject. Likewise, theological considerations lead Aquinas to describe a substance as “that to whose nature belongs *not* to be in something else.”¹⁵⁹ What matters for our purposes is that, according to Aquinas, it belongs to the nature, or quiddity, of an accident to exist in a subject whereas it belongs to the nature of substance to exist in itself (*per se*). I think Oresme would take this distinction on board.

Now, Aquinas holds that, because of its essentially dependent nature, an accident is more properly called “of a being” than a “being,” absolutely speaking.¹⁶⁰ But in Aquinas it is not clear whether this amounts to saying that (a) the being of an accident is just identical with the being of substance or (b) the being of accidents is essentially dependent on, yet distinct from, that of substance.¹⁶¹ However, as I argue below, Oresme makes clear that, although accidents are not full-fledged beings (e.g. as a substance), they do have a being that is *distinct* from the being of

¹⁵⁸ See for example, Aquinas, *Quodlibet IX*, q. 3, ad 2: “[H]aec non est vera definitio substantiae: substantia est quod per se est; vel: accidens est quod est in alio. Sed est circumlocutio verae descriptionis, quae talis intelligitur: substantia est res cuius naturae debetur esse non in alio; accidens vero est res, cuius naturae debetur esse in alio. Unde patet quod, quamvis accidens miraculose sit non in subiecto, non tamen pertinet ad definitionem substantiae; non enim per hoc eius naturae debetur esse non in alio; nec egreditur definitionem accidentis, quia adhuc natura eius remanet talis ut ei debeatur esse in alio” (emphases mine; in *Corpus Thomisticum*).

¹⁵⁹ Ibid.

¹⁶⁰ See, for example, Aquinas’s discussion in his commentary on Aristotle’s *Metaphysics*, Book XII, lect. 1, n. 2419).

¹⁶¹ Cf. Brown (1995), p. 57. Also, see Wippel (2000), pp. 253-265.

substances. This is what's characteristic of Oresme's theory of accidents as modes of things: that they enjoy a secondary way of being because of their essentially dependent nature.

That this is Oresme's view is clear from his analysis (and *rejection*) of two other, radically opposed views of accidents: first, the view according to which accidents are beings in the same way as substances; second, the view, according to which, accidents just are identical with substance (QP I.5, pp. 34-5). This shows that, although accidents lack the being that is proper to substance, namely, being per se, they do have *some* being, that is, they exist *through* substances.¹⁶²

In QP I.5, Oresme considers (and rejects) the two following ways of conceiving accidents:

View 1: “[I]n one way, [it can be thought] that it [i.e. an accident] is a true form inhering in substance, like a substantial form ... so that it is a true demonstrated essence, divisible and extended ... and properly signifiable by a substantive name, as it is imagined about whiteness” (my translation; QP I.5, p. 34).

View 2: “In the second way, it can be imagined that an accident is not in any way a thing outside the soul different from the underlying substance itself, but is merely the substance itself such-and-such disposed, according to which, different predicates are said of it; and thus, an accident is nothing different from substance except a predicate, and in this way some speak about any accident whatsoever except quality” (my translation; *ibid*).¹⁶³

¹⁶² In this chapter, I am interested in the arguments below insofar as they *elucidate* (rather than motivate) his account. For a discussion of the *motivations* behind Oresme's view of modes, see my previous chapter.

¹⁶³ Here's the entire passage: “*Secundo, notandum est quod accidens potest ymaginari tripliciter: uno modo quod sit vera forma inherens substantie, sicut forma substantialis, licet non intrinsice, ita quod sit vera essentia demonstrata divisibilis et extensa ad extensionem subiecti et proprie significabilis nomine substantivo, sicut ymaginatur de albedine. Secundo modo, quod accidens nullo modo preter animam sit alia res ab ipsa substantia subiecta, sed solum sit ipsa substantia taliter se habens, secundum quod de ea dicuntur diversa predicata, et sic accidens non esset aliud a substantia nisi predicatum, et isto modo dicunt aliqui de quolibet accidente excepta qualitate. Tertia via alia est, et posset ymaginari quod accidens non esset proprie forma extensa vel inherens secundum primam viam, nec solum substantia vel predicatum vel terminus iuxta secundam viam, sed esset aliquid tale esse aut tantum esse. Verbi gratia quod albedo non esset aliud quam album esse, quod proprie significaretur per nomen concretum cum isto infinitivo 'esse' et per nomen adiectivum*” (Oresme, QP I.5, pp. 34-5). The third way here described is Oresme's preferred view.

In order to get clear on these two ways of understanding “accident,” I shall use an example: Ockham’s view of qualities.¹⁶⁴ Ockham’s view of qualities is complex, but here I confine my discussion to two paradigmatic examples, those of whiteness (*albedo*) and shape (*figura*), to illustrate view 1 and view 2, respectively.

In his commentary on Aristotle’s *Categories*, Ockham maintains that the (sensible) quality of whiteness is a simple thing (*res*) totally distinct from the substance that is informed by it.¹⁶⁵ According to view 1 above, an accident is “a true form inhering in substance, like a substantial form” so that it is “a true essence, divisible and extended” and “properly signifiable by a substantive name” (Oresme, IP I.5, p. 34). This is precisely the account of whiteness Ockham gives. Like a substance, whiteness is able to subsist on its own, e.g. in the sacrament of the Eucharist, where the (sensible) qualities of the bread were commonly thought to subsist without a subject. Also, Ockham holds that whiteness (together with the other sensible qualities) is extended and divisible. Thus, it acquires an ontological status equal to that of substance, with the only difference that in ordinary, natural circumstances it does not subsist on its own but inheres in a substance.

By contrast, the quality of straightness is not a thing (*res*), which is simple and totally distinct from substance (Ockham, *In Praed* 14.12).¹⁶⁶ Rather, “straightness” is a (connotative) term that primarily signifies substance and secondarily its parts arranged in a certain way (ibid.). So there is only substance, whose parts are disposed in such-and-such a way. Going back to view 2 above, one can see the similarities. According to Oresme, on this second view, an accident just

¹⁶⁴ Indeed, Oresme may have Ockham in mind when he says that “in this way [i.e. the second way], some speak about any accident whatsoever except quality” (QP I.5, p. 34).

¹⁶⁵ Ockham, *In Praed* 14.4 and 12. *Opera phil* vol. 2, pp. 270, 287.

¹⁶⁶ Ibid. p. 287.

is (identical with) the substance, arranged in a certain way, so that a certain predicate, e.g. ‘straight,’ may apply to it. This is a merely conceptual or verbal way to understand “accident.”

In QP I.5 Oresme clearly rejects *both* accounts of accidents. Oresme rejects the first view precisely because it implies that substance and accident exist in the same way, i.e., *per se*. Oresme says: “no accident is a form or being [*essentia*] in accordance with the first way” (QP I.5, p. 36). For it would follow that “such an accident as whiteness... would be a substance” and would “truly be a being” or exist *per se* (QP I.5, p. 36). But this is false for Oresme. So an accident is not a “true form” as view 1 contends. Clearly, then, Oresme *denies* that substance and accidents exist in the same way. But why not think that accidents lack reality altogether then?

Oresme also explicitly rejects the second view. In QP I.5, Oresme merely appeals to authorities: “[N]o accident is substance.... This can be proved through many common authorities....” (p. 37). But, in QP II.4, Oresme provides several, different arguments for this claim.¹⁶⁷ Here I (briefly) provide his main one. Oresme contends that by *not* distinguishing between substance and accident, view 2 fails to explain accidental change (or alteration). (I discussed this in greater detail, in connection with quantity, above.) He explains: when something, say, changes color, the same subject is now disposed in one way and later in another (QP I.5, p. 199). But, if the way in which the subject is disposed is identical with the subject, then the way in which it is disposed now will be the same as the way in which it is disposed later. And this does not seem plausible (*verisimile*) (QP II.4, p. 199). Thus, the way in which the subject is disposed, e.g. the object’s color, cannot be identical with the subject itself. For this reason, Oresme rejects view 2, according to which an accident just is identical with its substance.

¹⁶⁷ Cf. QP I.6, p. 44.

Thus: on the one hand, Oresme's critique of the first view shows that a substance and its accidents are not *really distinct* entities, which exist in the same, robust sense, and that are capable of existing independently of one another. On the other hand, his critique of the second view indicates that accidents are not to be altogether reduced to (and identified with) their substances either. Rather: accidents are distinct from their substances, yet they exist in some secondary, and essentially dependent way, as the case of quantity discussed in the previous chapter reveals. So, even though accidents do not have being as substances do, they do have some (other) derivative being. But if this is right, then Oresme is an ontological pluralist, as I explain below.

Part II: Ways of Being

II.1) *Oresme's (Nominalist) Ontological Pluralism*

As I mentioned at the beginning of this chapter, OP is the doctrine that there are different ways of being. An ontological pluralist not only asks whether something exists or not but also *how* it exists (McDaniel 2010b, p. 628). By contrast, the ontological *monist* holds that "either something is or isn't, and that's all there is to say about a thing's existential status" (ibid.). As a warm-up example, consider how one, who is introduced to philosophy for the first time, may distinguish between the way in which, say, the number two exists and the way in which this table exists. She might be happy to say that there are numbers and there are tables. However, she may resist the claim that both exist *in the same way* (McDaniel 2009, p. 314). For instance, she might say that numbers exist atemporally whereas material objects, such as this table, exist relative to a time. Now, according to the ontological pluralist, to say that a material object such as this table

exists temporally is to say that, for such an object, to be is to be-at-a-time.¹⁶⁸ The existence of a material object is “strictly and literally relative to” a frame of reference, i.e. time (McDaniel 2010a, pp. 702, 705).¹⁶⁹

There are (at least) two ways of coherently formulating OP: one that takes the notion of ways of being “ontologically seriously,” which I shall call the *realist* formulation; and one that does not, which I shall call the *nominalist* formulation (McDaniel 2010a p. 692). According to the realist formulation, ways of beings are beings themselves, e.g. properties, *sui-generis* entities, and so on. Suppose existence is a *property*, either first-order (of individuals) or second-order (of other properties). OP would then say that “existence is *not* a natural property,” that is, it does not “carve nature at the joints” (McDaniel 2010a, p. 690). Rather: there are various natural properties, corresponding to the different ways of being, for which existence (or being) is “(something like) the mere disjunction” (ibid.).

Consider the example of *health*. Aristotle would say that an animal, food, and urine are healthy.¹⁷⁰ Suppose health is a (generic) property that they all share. Yet “that in virtue of which” they have this property is different in each case (McDaniel 2010a, p. 696). An animal is healthy

¹⁶⁸ Cf. McDaniel 2010a, pp. 701-705.

¹⁶⁹ Here’s another way to get an intuitive grasp of the view. In his (2010) Turner suggests we represent the ultimate “ontological structure” of reality as a “pegboard covered with rubber bands” (Turner 2010, p. 6). He explains: “When we say that there are some negatively charged particles, we say that some of reality’s pegs have the ‘negatively charged’ rubber band hanging from them” (ibid.) According to the ontological monist there is only *one* pegboard. The way to represent different ontological categories, such as abstracta and concreta, is to “hang different rubber bands on the pegs” (Turner 2010, p. 7). Different kinds of beings just are “divisions within this single structure” (ibid.). By contrast, the ontological pluralist holds that “reality has multiple ontological structures” and is represented by “*multiple, independent pegboards*” (emphasis mine; ibid.). For example, there is a pegboard for concrete objects and one for abstract ones. Another way to put this: whereas, according to the ontological monist, the true fundamental theory uses *one* existential quantifier, the ontological pluralist holds that such a theory uses “*multiple* existential quantifiers” (Turner 2010, p. 9).

¹⁷⁰ See, for example, Aristotle in *Metaphysics* IV, ch. 1: “Everything which is healthy is related to health, one thing in the sense that it preserves health, another in the sense that it produces it, another in the sense that it is a symptom of health, another because it is capable of it” (*Metaphysics* IV, 1003a34-1003b1; McKeon edition, p. 732.)

by, say, having “a certain proportion of humors” and qualities.¹⁷¹ Food is healthy by *producing* such a proportion of qualities in an animal. Urine is healthy by being a *sign* of such a state in an animal. One could argue that health is “something like a mere disjunction” whose disjuncts include the (more specific) properties just mentioned now, e.g. having a certain balance of qualities, being an efficient cause of such a balance, and so on (ibid.). Here the idea is that (i) the common property of health is not a (perfectly) natural property and (ii) each disjunct is *more natural than* the disjunction of them.¹⁷² One could provide a similar analysis of being and its different modes.

By contrast, according to the nominalist formulation, ways of being are *not* beings. Things exist in fundamentally different ways, yet the ways in which things exist are not entities themselves (McDaniel 2010a, p. 691). One may still be able to use a framework, such as the one recently defended by T. Sider (2009), “according to which we can apply the notion of naturalness to logical vocabulary, such as ‘existence,’ without assuming that this vocabulary corresponds to any entities” (ibid.). On this formulation, OP is the doctrine that “there are possible languages with semantically primitive, restricted existential quantifiers that are *at least as natural as* the existential quantifier in ordinary English” (McDaniel 2010a, p. 692). Let me briefly explain this claim.

First, a ‘*semantically primitive*’ expression is one which is semantically “simple, i.e. undefined” (McDaniel 2010b, p. 630). For example, consider the predicate ‘is blue’ in ordinary English (ibid.). This predicate, together with other basic color predicates, seems to be semantically primitive in English insofar as “there is no non-demonstrative, non-circular

¹⁷¹ Cf. Ockham, *In Praed.* 14.4 and 14.12, in *Opera phil.*, vol. 2, pp. 270, 287.

¹⁷² It’s worth noting that McDaniel does not think that health is a merely disjunctive feature, since its disjuncts are “unified in some way”; thus, it is an *analogous* feature instead (McDaniel 2010a, p. 696).

definition of ‘is blue’” (ibid., p. 631). Contrast this with the predicate ‘is grue.’¹⁷³ The latter expression is a semantically complex expression in English, since it is defined in terms of other basic color predicates, such as ‘is green’ and ‘is blue.’ Not only is the expression ‘is blue’ semantically primitive whereas ‘is grue’ is semantically complex, but ‘is blue’ is also “more *natural*” than ‘is grue’ (McDaniel 2010b, p. 630). Natural expressions are those that “carve reality at its joints” (ibid.). Consider for example the predicate ‘is an electron’ vs. the predicate ‘is thought by the author of this paper.’ The idea here is that the former carves nature at the joints far more than the latter. Likewise, ‘is blue’ is a more natural expression than ‘is grue,’ which is “gerry-mandered” or “merely disjunctive” (ibid. p. 631).

Drawing from Sider (2009), McDaniel extends the notion of a natural expression to quantifier expressions, such as the existential quantifier (ibid. p. 632). Moreover, he distinguishes the *unrestricted* quantifier, which is ordinarily used in English to quantify over everything there is, from a *restricted* quantifier, which “in virtue of its meaning, ranges over only some of what there is” (McDaniel 2010a, p. 692). For example, consider the *subsistence* quantifier, which ranges over all and only those entities, such as substances, that exist *per se*. One may use the following notation to represent it: ‘ $\exists_{\text{subsistence}}$ ’ (McDaniel 2009, p. 303).

The main idea of OP (in its nominalist formulation) is that, for every way of being, there corresponds a *restricted quantifier*, which ranges over all and only those things that have that kind of being.¹⁷⁴ Each restricted quantifier is *semantically primitive*, as the predicate ‘is blue’ in English. As such, a restricted quantifier is not to be understood as an expression “defined by way

¹⁷³ Following Goodman (1955), I shall define ‘is grue’ as ‘ x is green and is examined before the year 3000 A.D. or is blue and is not examined before 3000 A.D.’

¹⁷⁴ The domain of a restricted quantifier is a subset of the domain of the unrestricted quantifier (McDaniel 2009, p. 302).

of the unrestricted quantifier and a restricting predicate” (McDaniel 2010a, p. 692). On the version most relevant for our purposes, each restricted quantifier is *more natural* than the (unrestricted) existential quantifier in English. The unrestricted quantifier is to be understood *in terms of* the restricted quantifiers, e.g. a disjunction of them, and is thus more like the predicate ‘is grue.’

So: either ways of being are beings, e.g. properties, or they are not. Even if they are not, it may still be true to say that things exist in fundamentally different ways, which are not themselves entities. If so, one may use a framework, such as the one sketched above, to provide a nominalist account of OP. It is my contention that Oresme is an ontological pluralist, in the second (nominalist) way. Specifically, he holds that items falling under the category of substance, such as individual substances and substantial forms, exist in a fundamentally different way than items falling under the remaining nine (accidental) categories, such as qualities or quantities. Whereas beings falling under the category of substance exist by themselves (*per se*), accidents exist only by being related to substances (IP I.5. p. 35). (The relation at issue varies depending on the accidental category in question.) Thus Oresme recognizes at least two ways of being.¹⁷⁵ Yet he does not think that such ways of being are themselves beings.

If we want to apply McDaniel’s nominalist framework to Oresme’s account, we could argue that, on Oresme’s view, to say that there are different ways of being amounts to saying that different things, e.g. substances and accidents, exist in fundamentally different ways. For each way of being there corresponds a *restricted* quantifier: one ranging over all and only substances

¹⁷⁵ Oresme not only holds that there are different ways of being, i.e. the being of substance and the being of accident (Pluralism). He also thinks that the way of being of substance is prior to the way of being of accident (Priority). These two metaphysical claims underlie Oresme’s semantic theory of ‘being’: ‘Being’ is equivocal between substance and accident because of Pluralism, and it is analogous, in particular, because of Priority.

(*per se* quantifier); the other ranging over all and only accidents (*per aliud* quantifier). Since, for Oresme, the being of accidents is understood (and defined) in relation to the being of substances, we might say that only the *per se* quantifier is “semantically primitive.” As a result, such a (*per se*) quantifier is also a more “natural expression” than the *per aliud* quantifier. However, *both* restricted quantifiers are more natural than the unrestricted quantifier, which ranges over all (categorical) beings. Indeed, the unrestricted existential quantifier is to be understood in terms of the *per se* and *per aliud* quantifiers. (In what follows, I shall use Oresme’s talk of ways of beings in this sense.)

It’s important to note that Oresme calls the *accidents* themselves “*modi rerum*.” This expression is supposed to characterize the essentially dependent way of being of accidents, which are not things, properly speaking, but mere *modifications* of them. Oresme does not use the expression ‘modes of things’ to pick out different ways of being, as McDaniel understands them. Rather, on my interpretation, Oresme holds that all accidents as “modes of things” enjoy *one* fundamental way of being, which is distinct from, yet essentially dependent upon, the way of being of substances. The Latin expression which comes closer to McDaniel’s “way of being” is *modus essendi*, as for example Brito uses it. I briefly examine Brito’s view next.

II.2) A Contrast Case: Radulphus Brito’s (Realist) Ontological Monism

The main goal of this section is to contrast Brito’s (realist) ontological monism to Oresme’s (nominalist) ontological pluralism. To this end, I focus on Brito’s question-commentary on Aristotle’s *Physics* I (QSP), where Brito inquires whether substance and

accidents fall under the same concept of being.¹⁷⁶ Brito holds that the same ‘ratio’ or concept of being applies to substance and accidents because they both enjoy “one common way of being” (*unus modus essendi communis*), in virtue of which, each being is a being in its own right, or a being “formally speaking” (*formaliter*).¹⁷⁷ He thus calls such a way of being “*esse formaliter*.” He seems to conceive of this *modus essendi* as a real, fundamental feature of *all* categorial beings. Thus, I argue, Brito is a realist ontological monist.

Because substances and accidents share this feature, ‘being’ is said of them “equally” (*aeque*), at least insofar as both of them are entities in their own right. Yet substances are “prior” to accidents in some sense: accidents depend on substances “extrinsically,” as an effect depends on its efficient cause (*effective*).¹⁷⁸ Hence, although substance and accidents fall under the same concept of being, this concept applies to substance “in a prior way” (*per prius*). As a result, Brito too holds that ‘being’ is said *analogously* of them. But, unlike Oresme, this analogy “is much closer to univocation” (*analogia quae magis accedit ad univocationem*). In what follows, I examine some key passages from Brito’s QSP I, in which Brito clearly sets forth the metaphysical and semantic views I just outlined.

To begin with, Brito clearly distinguishes the way ‘being’ (*ens*) is predicated of substance and accidents from the way the adjective ‘healthy’ (*sanus*) is predicated of an animal, food, and urine:

¹⁷⁶ Radulphus Brito, *Quaestiones Super Physicam* I-VIII (ms. Firenze, Biblioteca Nazionale Centrale, Conv. Sopr. E.1.252, ff. 1ra – 60ra.). Henceforth I shall refer to this text as ‘QSP.’ All translations are mine unless otherwise noted. Donati (2003) suggests that this text was composed while Brito was still a Master of Arts at the University of Paris, at the end of the thirteenth century, before he became a master in the theology faculty in 1311/1312 (Donati 2003, p. 99).

¹⁷⁷ All quotations in this and the next paragraph are from Brito, QSP I, f. 6vb. I shall provide (and carefully examine) the relevant passages from this text below.

¹⁷⁸ Cf. Silvia Donati, “La discussione sull’unità del concetto di ente nella tradizione di commento della ‘Fisica’: commenti parigini degli anni 1270-1315 ca.,” in *Die Logik des Transzendentalen: Festschrift für Jan A. Aertsen zum 65. Geburtstag* (W. de Gruyter, 2003), p. 111.

A substance is a being [*ens*] *formaliter* through the being [*entitatem*] which is in it and an accident is a being [*ens*] *formaliter* through the being [*entitatem*] which is in it, in such a way that the case of ‘healthy’ and that of ‘being’ are not similar: for an animal is healthy *formaliter* through the health that is in it, but food is not healthy *formaliter*; rather, health is here [e.g. in the food] just as in an efficient cause, for food produces health in an animal; and health is in urine as in a sign [of it]. However, it is not so in the case of ‘being’ with respect to substance and accident; for substance is a being [*ens*] *formaliter* through the being [*entitatem*] that is in it and an accident is a being [*ens*] through the being [*entitatem*] which is in it *formaliter*; therefore, being [*ens*] in either case has being [*esse*] *formaliter*.¹⁷⁹

In this passage, Brito maintains that substance and accidents are beings in the same (primary) way, that is, “through the being [*entitatem*] which is in each one of them.” Consequently, each one of them is a “being, formally speaking [*ens formaliter*].” By contrast, an animal and food are *not* healthy in the same way: for an animal is healthy by the health that is in it, e.g. a certain proportion of “humors” and qualities, whereas food is healthy by producing such a condition in an animal, that is, as an efficient cause.¹⁸⁰ Thus, whereas an animal is healthy “*formaliter*,” food is not – rather, food is healthy “*effective*.” As Silvia Donati (2003) explains, thus Brito concludes that substance and accident fundamentally share the same *modus essendi*, namely, “the *esse formaliter*, which consists in the fact that both substance and accident are beings in virtue of the being [*entità*] that is in them and not in virtue of the relation to a being [*entità*] that exists in something else” (my translation; Donati 2003, p. 106).

Now, this is precisely what Oresme *denies*: that accidents have a being of their own, as substances do (QP I.5, p. 35). Rather, he holds that accidents are beings only insofar as they

¹⁷⁹ Here’s the entire Latin passage: “*Substantia est ens formaliter per entitatem quae est in ipso, ita quod non est simile de sano et de ente, quia animal est sanum formaliter per sanitatem quae est in ipso, sed cibus formaliter non est sanus, sed est ibi sanitas sicut in efficiente, quia cibus efficit sanitatem in animali, sed in urina est sanitas sicut in signo. Sic autem non est de ente respectu substantiae et accidentis; immo substantia est ens formaliter per entitatem quae est in ipso et accidens est ens per entitatem quae est in ipso formaliter; ergo ens utrobique habet esse formaliter*” (QSP, f. 6vb; qtd. in Donati 2003, p. 106).

¹⁸⁰ Again, here I borrow Ockham’s definition of health as a “certain proportion of humors and qualities.” (See n. 27 above.)

“belong to,” or “are accidental to,” a genuine being, i.e. substance (ibid.). That is, they are beings in virtue of their *relation* to substance. Using Brito’s language, it would seem that, on Oresme’s view, what is characteristic of accidents is their *lack* of “being, formally speaking” (*esse formaliter*). In fact, Donati contrasts Brito’s view with “radical conceptions” of accidents, according to which, “an accident is not properly a being but only a *dispositio* or *modus* of substance” (my translation; Donati 2003, p. 107). Such views deny that accidents have any “reality of their own independently of [their] relation to substance” (ibid.). Although Donati does not explicitly mention Oresme among the defenders of these views, he clearly holds a view of this kind, as I explained above. (See section I.2.)

As with Oresme, Brito’s metaphysical views explain his semantic views. Brito argues that since (a) a substance is a being, formally speaking (*formaliter*), that is, in virtue of the being (*entitas*) that is in it, and (b) accidents are beings in the same way, both substance and accidents have “*esse formaliter*.” But this *esse* is “a certain way of being of a being” (*quidam modus essendi entis*). Thus, Brito argues, “there is one common way of being for each being in substance and accident.” As a result, one common concept of being may be drawn.¹⁸¹ As Donati (2013) explains, all categorial entities share “one common feature”: “each is a being in virtue of a principle – its own entity – which formally exists in it” (Donati 2013, p. 348). This “completely abstract property,” what Brito calls the *esse formaliter*, which is shared by all categories, is the

¹⁸¹ The entire Latin passage goes as follows: “*In quibuscumque reperitur unus modus essendi communis, ibi reperitur una ratio communis; sed in substantia et accidente reperitur unus modus essendi communis ipsius entis; ergo in substantia et accidente erit una ratio communis secundum se. Maior patet. Probatio minoris, quia substantia est ens formaliter... Ergo ens utrobique habet esse formaliter. Modo esse in aliquibus formaliter est quidam modus essendi entis; ergo in substantia et accidente est unus modus essendi entis communis; ergo ab illo uno modo essendi communi poterit sumi una ratio ipsius entis in substantia et accidente*” (QSP, f. 6vb; qtd. in Donati (2003), p. 106).

common *modus essendi* which provides “the extramental foundation” for the unity of the concept of being (Donati 2013, p. 348).

It’s worth noting here that Brito seems to treat of the *esse formaliter* as a *real*, fundamental feature (or property) possessed by substances and accidents alike. Donati (2013) explains that “Brito does seem to conceive this modality of being [i.e. the *esse formaliter*] as something real, a real feature belonging to extra mental things” (p. 353).¹⁸² Now, on the one hand, since there is *one* way of being that is shared by substance and accidents, Brito counts as an ontological monist. On the other hand, since Brito seems to conceive of this *modus essendi* as some real, fundamental property which belongs to all categorial beings, his view seems to count as realist, as I explained at the beginning of section II.1.

Even though accidents have the same ontological status as substances, by enjoying the same way of being as them, Brito holds that substances are “prior to” accidents in some way, namely, as an efficient cause with respect to its effect. Using Brito’s terminology, accidents depend on their substances “effective.”¹⁸³ Thus ‘being’ is predicated of substance and accidents analogously.¹⁸⁴ But, Brito specifies, the analogy of ‘being’ (*ens*) differs from the analogy of

¹⁸² This raises a problem for Brito’s view: Brito seems to think that the *esse formaliter* is a *real* feature (or property) of all categorial beings. If so, it too is a being. But what kind of being is it? Is it a *genuine* being as all categorial beings are? If so, does that mean that it too has *esse formaliter*? If not, does that mean that this *modus essendi* itself enjoys a *different* way of being? Brito does not seem to answer these questions. (Cf. Donati 2003, p. 126.) For the purposes of this paper, I shall set this problem aside.

¹⁸³ Brito says: “*Sed ne aliquis obiciat, est intelligendum quod accidens effective dependet a substantia, tamen, sicut substantia est ens per entitatem quae est in ipsa formaliter, ita accidens est ens per entitatem quae est in ipso formaliter; unde aequae formalis praedicatio est dicendo: ‘albedo est ens’ sicut dicendo: ‘substantia est ens’* (QSP, f. 6vb; qtd. in Donati 2003, p. 110). It’s worth noting here the similarity between Brito’s and John Duns Scotus’s views on the ontological status of accidents. Scotus (1265/66-1308), a contemporary of Brito, also maintains that accidents have a being of their own in virtue of which they are beings yet, from the point of view of efficient causality, they depend upon an extrinsic cause, namely, substance. For a brief discussion of this, see Donati (2003), p. 111, and Donati (2013), p. 343.

¹⁸⁴ *Secundum declaratur, scilicet quod ratio entis sit secundum prior et posterius a substantia et ab accidente participata, quia quando aliqua sic se habent quod unum illorum est sicut causa et alterum est effectus quod dependet ex illa causa, quando aliquid convenit istis, per prius inest causae quam causato, et maxime quando causatum dependet totaliter ex causa. Modo accidens se habet ut causatum respectu substantiae; ergo quidquid*

‘health’ (*sanum*). For whereas the former is much closer to *univocation* the latter is close to *equivocation*:

I posit a twofold analogy, one such that it comes near to equivocation, when something has different accounts [*rationes*] in several things of which one is ascribed to another. This is the case of ‘healthy’ [*sanum*], since ‘healthy’ is not predicated in the same way of an animal, urine, and food; therefore, it is predicated according to different accounts. Another analogy is one which is much closer to univocation, namely, when the account [*ratio*] of something in itself [*secundum se*] is one, even though such an account is participated by one thing in a prior [*per prius*] way than by the other, just as heat is participated by fire in a prior way than by other hot things. And this type of analogy is found in ‘being.’¹⁸⁵

As I explained earlier, Brito distinguishes the way ‘healthy’ is predicated of an animal, urine, and food from the way ‘being’ is predicated of substance and accidents. Whereas both substance and accidents are beings “*formaliter*,” by the being that is in each one of them, the items mentioned above are not healthy in the same way: only an animal is healthy by the health that is in it (*formaliter*) whereas food and urine are healthy by being productive of health and being a sign of it, respectively. Even though food and urine are healthy in a way that refers to (or is ascribed to) the health that is in animal, this type of analogy is closer to equivocation. For ‘healthy’ is said of an animal, food, and urine, “according to different accounts.” By contrast, ‘being’ is said of substance and accidents according to the same account, even though ‘being’ is said of substance “in a prior way” due to the fact that substance is the efficient cause of the being of accidents – just as fire is the efficient cause of heat in other hot things.

inerit istis per prius inerit substantiae quam accidenti. Ratio ergo entis per prius participatur a substantia quam ab accidente, sicut caliditas per prius participatur ab igne quam a ferro.” (qtd in Donati 2013, p. 350, n. 29).

¹⁸⁵ “*Neque etiam est analogum ita quod sit analogum per diversas rationes. Unde pono duplicem analogiam, unam talem quae accedit ad aequivocationem, quando aliquid habet diversas rationes in multis quorum unum habet attributionem ad aliud. Sicut est in sano, quia sanum non habet eundem modum predicandi de animali, urina, et cibo; immo praedicatur secundum diversas rationes. Alia est analogia quae magis accedit ad univocationem, scilicet, quando ratio alicuius secundum se est una, tamen illa ratio per prius participatur ab uno quam ab alio, sicut calor per prius participatur ab igne quam ab aliis calidis. Et talis analogia reperitur in ente*” (Brito, QSP, f. 6vb; qtd. in Donati 2013, p. 351).

Like Brito, Oresme too holds that ‘being’ is said of substance and accidents analogously, that is, is it said “more principally” of substance and “less principally” of accidents (QP I.5, p. 32). However, for Oresme, analogy is a type of *equivocation*: ‘being’ is said of substance and accidents according to different (albeit related) accounts, so that ‘being’ is said of them *equivocally* (as well as analogously) (QP I.5, p. 35). But what matters here is the reason why Oresme thinks this: for accidents *lack* a being of their own (*essentia de se*) and depend on substance not only “with respect of their existence” but also “with respect of their quiddity” (Oresme, QDA I.5, p. 119). As I have explained in Part I, this implies that accidents exist in a way that is distinct from, yet *essentially dependent on*, the being of substances. Thus, Oresme’s ontological *pluralism* underlies his semantic account of the analogy of ‘being.’ By contrast, Brito holds that substance and accidents enjoy the same way of being, that is, *esse formaliter*, and accidents depend on substances (merely) “extrinsically.”¹⁸⁶ Thus even though ‘being’ is said of substance “in a prior way,” ‘being’ is said of substance and accidents according to the same account, by which, each of them is a being in virtue of its own being.

We are thus ready to compare Oresme’s ontological pluralism to the ontological monism of Brito. On the one hand, Oresme holds (i) that there are at least two different ways of being: the way of being of substances, i.e. being in itself (*per se*), and the way of being of accidents, i.e. being through another (*per aliud*). In particular, (ii) the being of accidents *intrinsically* depends on the being of substance. As a result, accidents exist in some secondary way and they are less than full-fledged beings. Thus (iii) ‘being’ is said of accidents and substances *equivocally*,

¹⁸⁶ Cf. Donati (2013), p. 343: “[F]rom the formal point of view, ‘being’ is predicated of substance and accidental categories in an equally primary way, since in both cases the predication is based on a principle formally inhering in the subject” (emphasis mine; p. 343). Brito is nonetheless able to retain “the traditional tenet of the primacy of substance” but confines it “to the extrinsic sphere of efficient causality” (ibid.).

“taking ‘equivocal’ as analogous, in such a way that [‘being’] is properly ... said of substance, secondarily of accident” (QP I.5, p. 35).

By contrast, Brito maintains (i) that substance and accidents enjoy “one common way of being,” namely, the *esse formaliter*: each is a being in virtue of the being (*entitas*) that is in them (and not in another). So accidents and substances are equally genuine beings. (ii) Accidents depend on substances “extrinsically” as an effect depends on its efficient cause (*effective*). Thus, (iii) ‘being’ is said of substance and accidents analogously: it is said of substances “in a prior way” and of accidents “in a posterior way.” But this analogy of ‘being’ is much closer to straightforward univocation.

Remarkably, even though Oresme’s view of accidents implies that there are different ways of being (ontological pluralism), he does not seem to think of such ways of being as beings themselves. Rather, on Oresme’s views, to say that there are different ways of being just amounts to saying that there are different things, i.e. substances and accidents, which exist in different ways. (See section II.1 above.) By contrast Brito, who posits one fundamental way of being (*modus essendi*) shared by substance and accidents, seems to think of this *modus essendi* as a real feature that belongs to all categorial beings. Thus, he seems to be a realist in this respect.¹⁸⁷

In my final analysis, I’d like to return to Oresme’s account of accidents *as modes of substance* in light of Brito’s account. As I showed in section I, Oresme thinks that whereas a substance is a genuine being (*vere ens*), an accident is merely a “disposition or condition” of a substance (QP II.6, p. 205). As a result, accidents lack a being of their own and **essentially depend** on the being of substances. This implies that accidents exist in a lesser way than

¹⁸⁷ This raises the question about the ontological status of this *modus essendi* itself, but I shall set aside this problem, for the purposes of this chapter.

substances. Thus, the special (*intrinsic*) dependence of accidents on substances seems to imply that accidents exist in some secondary and derivative way, for Oresme.

By contrast, Brito ascribes to accidents the same ontological status as substances. But he also holds that accidents depend on substance *merely* “extrinsically,” as an effect depends on its efficient cause. Brito seems to posit this relation of dependence between substance and accident in order to preserve the priority of substance over accident. However, this type of “extrinsic” dependence allows accidents to be genuine entities just as much as substances. So, perhaps, Brito too shares with Oresme the assumption that intrinsic (or quidditative) dependence implies that accidents are less than full-fledged beings. Although I have not examined in this paper whether this is a *true* assumption, this seems to be a key idea behind Oresme’s account of accidents as *modes* of things.

Back to Quantity

As I discussed in Chapter 5, Oresme holds that quantity, like all other accidents, is a mode of substance. As such, quantity exists in a lesser way than substance does and quantity is *essentially dependent* upon its substance. Understanding Oresme’s ontology and meta-ontology of accidents helps us shed light on the metaphysical relationship between quantity and substance, on his view. Unlike Buridan, Oresme holds that quantity *cannot* exist without substance. Because of these beliefs, Oresme struggles to explain the doctrine of transubstantiation, according to which the physical qualities of the bread remain without inhering in any substance. And, after the condemnation of John of Mirecourt of 1347, Oresme no longer mentions his theory of accidents as modes of things. But this view resurfaces later on in Descartes’ (meta)physics of bodies.

LOOKING FORWARD: DESCARTES ON BODY AND EXTENSION

In this final section of my dissertation, I aim to examine (i) Descartes' view of material substance against the late medieval, Scholastic background discussed in Parts I-III above; (ii) to what extent (if any) Ockham's, Buridan's, and Oresme's conceptions of bodies and extension anticipate Descartes' corpuscularianism, according to which bodies are *essentially* extended and divisible into (physical) parts; and (iii) the motivations, both philosophical and theological, underlying their views vs. Descartes'. As I show below, after a careful reconstruction and analysis of Descartes' conception of material substance, its attributes, and modes, my answer to (ii) is: to *some* extent. I elaborate on (iii) below.

As I mentioned in the Introduction of my dissertation, the mereological conception of material substance espoused by Ockham, Buridan, and Oresme anticipates corpuscularianism (as defined above) in at least this respect: that it conceives of material substances as essentially divisible into physical (or integral) parts.¹⁸⁸ However, our three fourteenth-century authors think of quantity, or extension, as an accident of material substance because of (at least in part) their commitment to transubstantiation. Moreover, and more interestingly, they think of quantity as a variable feature of bodies; this follows from their understanding of C/R, strictly speaking, as I have shown above. This is a key feature of material substance, on the Scholastic, Aristotelian view, that has not been sufficiently highlighted by scholars.

Yet this feature reveals a fundamental distinction between the late medieval notion of material substance, as discussed in this work, and the early modern view of natural philosophers, such as Descartes, who holds that the extension of a body is *invariable*. Indeed, to support his view, Descartes denies that C/R, as Scholastic thinkers understand it, is possible. He conceives of

¹⁸⁸ See Lagerlund (2012) on this as well.

C/R, on the so-called sponge model (which I discussed in chapter 1), as a mere change of shape. But Descartes' theory of bodies and quantity conflicts with transubstantiation. This is still very much a problem for him as it was for our three late medieval authors.

In the rest of this chapter, first, I reconstruct Descartes' metaphysics of bodies and extension in light of his critique of the Scholastic notions of C/R and material substance. Second, I reconstruct Descartes' ontology of attributes and modes, focusing on the properties of material substances. Finally, I compare Descartes' theory of quantity to those of Ockham, Buridan, and Oresme, as set forth in Parts I-III of this work.

Section I: Descartes on Bodies, Extension, and C/R

In the *Principles of Philosophy*, Part Two, Descartes lays down “the principles of material things” (CSM I, p. 223). In article 4, he argues that “the nature of body” consists “simply in its being something which is extended in length, breadth, and depth” (CSM I, p. 224). So, he believes the nature of body consists “solely in extension” (CSM I, p. 225). In article 5, Descartes raises two concerns for his view: a certain theory of condensation and rarefaction (C/R); and the existence of empty space (CSM I, p. 225). Here I am concerned with the first problem alone. (With respect to the second one, I will just assume that there is no empty space (or *vacuum*), a belief that Descartes and his medieval predecessors shared.¹⁸⁹) What is the view of C/R that may cause one to doubt Descartes' view of the nature of body? And why is that a problem for Descartes?

The worrisome “widespread belief” in question is the following: “that many bodies can be rarefied and condensed in such a way that when rarefied they possess more extension than

¹⁸⁹ At least the ones I am concerned with in my dissertation.

when condensed” (emphasis mine; CSM I, p. 225). This is what Aristotle and his medieval followers thought: when a body rarefies, that body itself comes to be more extended without acquiring any new material parts, unlike growth through nutrition.¹⁹⁰ But Descartes finds this account unintelligible, since he thinks that there is no real distinction between a body and its extension. He says, “There is no real difference between quantity and the extended substance; the difference is merely a conceptual one” (CSM I, p. 227). Thus, he argues, “it is a complete contradiction to suppose that something should be augmented by new quantity or new extension without new extended substance, i.e. a new body, being added to it at the same time” (ibid.). (In what follows, I use ‘quantity’ and ‘extension’ as well as ‘material substance’ and ‘body’ as interchangeable.) How does Descartes explain C/R then?

He uses what in Chapter 1 I called “the sponge model.” As I explained above, a rarefied body, for Descartes, is like a sponge filled with water: a body with gaps (or pores) between its parts “filled” by some other body (or bodies). When a body condenses, its parts come closer together by squeezing out the foreign body (or parts thereof), e.g. like squeezing water out of a wet sponge. By contrast, rarefaction occurs when the body widens its gaps, so to speak, as a sponge dipped in water. Thus, one and the same body comes to have greater or less extension by simply widening or closing the gaps between its parts, which are occupied by other bodies. The key idea here is that the *body itself*, which condenses or rarefies, does *not* change its extension: it

¹⁹⁰ Cf. Aristotle, *Physics* IV, 9: “Further, the matter of a body is the same when it is large and when it is small. This is clear, for when air comes to be from water, the same matter without acquiring anything in addition becomes another thing: what it was potentially it becomes actually. [...] So too the largeness and smallness of the perceptible body are extended, not because the matter acquires anything extra, but because it is potentially the matter of either. So the same thing is dense and rare, and the matter of them is one” (E. Hussey transl., Aristotle’s *Physics* (Oxford UP 1983), p. 40). Note: when some thing “is dense and rare,” numerically the same matter “without acquiring anything in addition” becomes large and small. So, the same chunk of matter becomes more or less extended without the addition (or loss) of any matter.

comes to occupy a smaller or larger place simply because of some *other* body. Therefore, C/R turn out to be a mere “change of shape” (CSM I, p. 3). This corresponds to what Ockham, Buridan, and Oresme think of C/R, broadly speaking.

While Descartes finds it “very easy for us to see how rarefaction can occur in this way,” he thinks that “we cannot see how it could occur in any other way” (CSM I, pp. 225-226). In particular, he puzzles at the Scholastic view, according to which, C/R occur through an increase or decrease in the quantity (or extension) of the body itself, without anything else being added. What lies at the heart of this disagreement is a different conception of material substance and its relation to quantity, or extension.

Just as Ockham, Buridan, and Oresme do, Descartes understands quantity, “or ‘continuous’ quantity, as the philosophers commonly call it” as the “extension of ... the thing which is quantified in length, breadth, and depth” (*Fifth Meditation*, CSM II, p. 63). But Descartes holds that extension is the *nature* of material substance and that there is only a conceptual distinction between material substance and quantity. By contrast, Descartes argues, “When they [e.g. Scholastic philosophers] make a distinction between substance and extension or quantity, either they do not understand anything by the term ‘substance,’ or else they simply have a confused idea of incorporeal substance, which they falsely attach to corporeal substance; and they relegate the true idea of corporeal substance to the category of extension, which, however, they term an accident” (*Principles* II, art 9, CSM I, pp. 226-227). For Descartes, extension is (the nature of) body. Bodies are essentially extended and divisible into parts whereas thinking substance is “utterly indivisible” (*Sixth Meditation*, CSM II, p. 59).¹⁹¹ But what

¹⁹¹ CSM II, *Sixth Meditation*: “The first observation I make at this point is that there is a great difference between the mind and the body, inasmuch as the body is by its very nature always divisible, while the mind is utterly indivisible. For when I consider the mind, or myself insofar as I am merely a thinking thing, I am unable to distinguish any parts

Descartes fails to see is that (at least some) Scholastic authors carve out a third option, according to which material substances are essentially divisible into parts yet they are accidentally extended. Not only does Descartes find the Scholastic notion of material substance objectionable, he also attacks the Scholastic notion of real accidents.

On Descartes's view, to think of a quality as a *res*, really distinct and separable from any other *res*, seems to treat of a quality as a *substance* rather than an accident. In the *Sixth Set of Replies* Descartes argues: "[I]t is completely contradictory that there should be real accidents, since whatever is real can exist separately from any other subject; yet anything that can exist separately in this way is a substance, not an accident" (CSM II, p. 293).¹⁹² (Also, see Descartes' response to Arnauld in the *Fourth Set of Replies*.¹⁹³) Descartes assumes that, if something is "real," then it "can exist separately from any other subject"; but if something "can exist separately from any other subject," then it is a substance, not an accident. So, (C1) only

within myself; I understand myself to be something quite single and complete. Although the whole mind seems to be united to the whole body, I recognize that if a foot or arm or any other part of the body is cut off, nothing has thereby been taken away from the mind. As for the faculties of willing, of understanding, of sensory perception, and so on, those cannot be termed parts of the mind, since it is one and the same mind that wills, and understands, and has sensory perceptions. By contrast, there is no corporeal or extended thing that I can think of which in my thought I cannot easily divide into parts; and this very fact makes me understand that it is divisible. This one argument would be enough to show me that the mind is completely different from the body, even if I did not already know as much from other considerations" (emphases mine; p. 59)

¹⁹² Latin text: "*Ac deinde, omnino repugnat dari accidentia realia, quia quicquid est reale, potest separatim ab omni alio subiecto existere; quicquid autem ita separatim potest existere, est substantia, non accidens*" (AT VII, p. 434). The relevant objection is this: "Nor do we grasp your assertion that there are no real accidents belonging to any body or substance – accidents which could by divine power exist apart from any subject, and which do really exist in the sacrament of the altar" (*Sixth Set of Objections*, CSM II, p. 281). I shall return to this important objection to Descartes' doctrine of attributes and modes, properly speaking, at the end of my prospectus.

¹⁹³ Descartes, *Fourth Set of Replies*: "[T]he human mind cannot think of the accidents of the bread as real, and yet existing apart from its substance, without conceiving of them by employing the notion of a substance. So it seems to be a contradiction, given that the whole substance of the bread changes, as the Church believes, to suppose that something real which was previously in the bread nonetheless remains. For if something real is understood to remain it must be thought of as something which subsists; and though the word 'accident' may be used to describe it, it must nonetheless be conceived of as a substance. Hence the supposition that real accidents remain is in fact just like saying that the whole substance of the bread changes but nevertheless a part of that substance called 'a real accident' remains. And though this may not be a verbal contradiction, it certainly involves a conceptual contradiction" (CSM II, p. 176).

substances are “real” in this sense; (C2) accidents can’t exist separately from any other subject. But if they can’t exist separately from any other subject, then they are not “real” either. It’s worth noting that, for Descartes, to deny the “reality” of accidents amounts to denying *their ability to exist separately from any other subject*. But this does not mean that accidents are therefore nothing. Rather, it means that accidents cannot exist without the substance to which they belong. Indeed, Descartes holds that accidents are “*modes*” of substance.¹⁹⁴

Section II: Descartes’ Theory of Modes

Although Descartes often uses such terms as ‘attribute’ and ‘mode’ interchangeably to refer to any property of a substance, whether essential or accidental, in *Principles* I.56 he introduces a technical notion of modes and attributes. Descartes holds that modes, properly so called are changeable properties of a substance (CSM I, p. 211). For example, the shape of a body is one of its modes. By contrast, attributes, properly so called are “unmodified” properties that are “in” a substance (ibid.). For example, a body’s extension is one of its attributes. Descartes further articulates these notions in articles 61 and 62, where he explains modal and conceptual distinctions, respectively. In what follows, I use the terms ‘mode’ and ‘attribute’ in their technical senses. Below I first briefly examine Descartes’ conception of (created) substance and attributes; I then focus on his theory of modes.

¹⁹⁴ On the account Descartes sets forth in *Principles* I.56 and 61, a mode is a *particular, maximally determinate* property, which *depends* on the substance of which it is a mode for its existence (CSM I, pp. 211-215). Now, although a substance *must* have some mode or other of certain determinable kinds, a substance does not require any particular one of its modes for its existence. Because of their ontological dependence on substances, accidents exist in a lesser way, according to Descartes.

In *Principles* I.56 and I.62, Descartes describes an attribute as a property without which the substance whose attribute it is cannot exist.¹⁹⁵ Descartes thinks that there are two kinds of attributes. Following Chappell (1997, 2008), I call one kind “*uni-generic*” attributes, namely, thought and extension; and I call the other kind “*omni-generic*” attributes, namely, existence, duration, and number. The first kind divides (created) substances in material and thinking substances. Each material substance, or body, has its attribute of extension, and each thinking substance, or mind, has its attribute of thought. Attributes of the second kind are found in all substances irrespective of whether they are bodies or minds. Each substance has its existence, duration, and number.¹⁹⁶ (In the rest of this chapter, I set aside omni-generic attributes.)

Descartes seems to hold that a substance is identical with its *uni-generic* attribute. In *Principles* I.63 Descartes says, “Thought and extension can be regarded as constituting the natures of intelligent substance and corporeal substance; they must then be considered as *nothing else but* thinking substance itself and extended substance itself” (emphasis mine; CSM I, p. 215). If so, the uni-generic attributes turn out to be *res* as defined above, that is, substances.

But what are modes? I argue that modes are tropes.¹⁹⁷ The term ‘tropes’ was first introduced by D. C. Williams in his seminal work, “On the Elements of Being I” (1953). Tropes are usually characterized as “ontologically unstructured (simple) abstract particulars.”¹⁹⁸

¹⁹⁵ Cf. Descartes’ letter to an unknown correspondent from 1645 or 1646, in which he distinguishes modes, properly so called, from attributes, properly so called, which he characterizes as those properties “without which the things whose attributes they are cannot be” (CSMK III, p. 280).

¹⁹⁶ Here I shall assume that all properties in Cartesian ontology are *particular*. For Descartes holds that there are no universals. Cf. *Principles* I.55, 57, 58-58. Also, cf. Nolan (1997, 1998) and Chappell (2008).

¹⁹⁷ Cf. Chappell (2008). In his article, Chappell suggests that “Descartes may... hold that all modes or attributes are tropes, at least all those that are real” (Chappell 2008, p. 257). Although Chappell offers a very brief argument for this suggestion, he does not fully explore this thesis in his paper. Also, he does not distinguish between attributes and modes, properly so called, but uses the expression “attribute or mode” to cover any property in Cartesian ontology. In this section, I defend Chappell’s thesis as it applies to modes, properly so called, as Descartes defines them in *Principles* I.56 and 61 (CSM I, p. 211-214).

¹⁹⁸ Maurin, Anna-Sofia, “Tropes”, *The Stanford Encyclopedia of Philosophy* (Fall 2013 Edition), Edward N. Zalta (ed.), URL = <<http://plato.stanford.edu/archives/fall2013/entries/tropes/>>.

However, there is much disagreement on how to precisely understand this characterization. Here I follow P. Simons's account, as set forth in his (1994), according to which tropes are "*dependent concrete particular[s]*" (Simons 1994, p. 557). Let me briefly explain what Simons means by this.

First, like substances, tropes are particular and by nature unshareable.¹⁹⁹ (Conversely, we normally think of universals as "entities that involve an element of sharing" (Maurin 2002, p. 8).)²⁰⁰ However, unlike substances, tropes are abstract. Now, there are different ways of understanding the term 'abstract.' Simons suggests the following two ways: (i) as lacking both temporal and spatial location; (ii) as being incapable of independent existence (Simons 1994, p. 557). Simons holds that tropes are abstract in sense (ii), but not in sense (i). For, like substances, tropes have "at least temporal location, if not spatial location as well," and are in this sense *concrete* (ibid.). However, whereas substances can exist of themselves, tropes are "incapable of independent existence" (ibid.). Thus, Simons characterizes substances as "*independent concrete particulars*" and tropes as "*dependent concrete particulars*" (ibid.).

For the purposes of this chapter, I'd like to draw attention to two distinguishing features of tropes, as Simons understands them: first, they are particular; second, they are dependent entities. I'm especially interested in the type of *dependency* at issue here, which distinguishes a trope from a substance. The relevant relation is what Simons calls *strong* foundation (Simons 1994, p. 559).

Def: an individual A is strongly founded on an individual B iff A is necessarily such that (i) it cannot exist without B and (ii) B is not a part²⁰¹ of A (ibid). Also assume that A is not identical with B. (Simons does not clearly state this assumption.)

¹⁹⁹ Cf. Maurin (2002), p. 8.

²⁰⁰ Simons: "The defining characteristic of universals is that they may be multiply exemplified" (Simons 1994, p. 557).

²⁰¹ Here by 'part' I mean a proper part, whose formal properties are the following:

1. Irreflexivity: nothing is a proper part of itself.
2. Asymmetry: If P1 is a proper part of P2, then P2 is not a proper part of P1.
3. Transitivity: If P1 is a proper part of P2 and P2 is a proper part of P3, then P1 is a proper part of P3.

Now, whereas tropes are strongly founded on something, either some other trope(s) or the substance to which they belong, a substance is not strongly founded on anything. Thus, whereas tropes are *dependent* concrete particulars, substances are *independent* concrete particulars.

In this section, I do not defend Simons's conception of tropes as the most plausible or interesting account of tropes, even though I assume that it is (at a minimum) consistent. Rather, Simons's account provides us with a useful model to get a grip on Descartes's theory of modes as well as the relations between modes, substances and attributes. I argue that *modes* are particular and they are (individually) *strongly* founded on the substance to which they belong. They are thus tropes. Conversely, a substance is *not* (individually) strongly founded on any one of its modes.

Descartes fully articulates his notion of a "mode, properly so called" in *Principles* I.61, where he explains "what is meant by a 'modal distinction'" (CSM I, p. 213). Descartes holds that such a distinction exists, first, "between a mode, properly so called, and the substance of which it is a mode"; and, second, "between two modes of the same substance" (CSM I, pp. 213-4). (Here I will focus on *created* substances only, setting aside the case of God.) As I show below, on the account Descartes sets out here, a mode is a *particular, maximally determinate* property, which *depends* on the substance of which it is a mode for its existence. Now, although a substance *must* have some mode or other of certain determinable kinds, a substance does not require any particular one of its modes for its existence.

For example, consider the round shape of the coffee cup lid in front of me right now. On the one hand, the particular and maximally determinate round shape of the lid, R, cannot exist

Cf. L.A. Paul 2002, p. 581

without this lid, L. On the other hand, L may continue to exist while R is replaced by another shape. (I may bend the lid so that its shape is now oval.) It would seem that the lid must have some shape or other, but it does not require R, in particular, to exist. So, the relations of dependence that hold between modes and substances are the following:

1. A mode is necessarily such that it cannot exist unless its substance exists.
2. A mode *individually* depends on its substance. That is: *this* mode M requires *this* substance S for its existence, not merely some substance or other.²⁰²

By contrast:

3. A substance is necessarily such that it cannot exist unless some mode or other of certain determinable kinds exists.
4. A substance *specifically* depends on its modes. That is: this substance S does not require this mode M to exist, but it does require some mode or other of certain determinable kinds.²⁰³

Is a mode *strongly* founded on its substance? First, a mode is not identical with its substance. For a substance can exist without its mode, even though that mode cannot exist without its substance. Second, a mode is necessarily such that it cannot exist without its substance. Third, although perhaps a mode may be considered to be a proper (logical, qualitative) part of the substance, certainly the substance to which a mode belongs is not a proper part of the mode. Thus, a mode is strongly founded on its substance.

Conversely a substance is not strongly founded on any one of its modes. For, first and most importantly, a substance is such that it *can* exist without any one of its modes. (A substance only requires some mode or other from certain determinable kinds to exist.) Second, a mode may be considered a proper (logical, qualitative) part of the substance to which it belongs.²⁰⁴ Thus, both condition (i) and, possibly, condition (ii) fail in the case of substance in relation to modes.

²⁰² Cf. Simons 1994, p. 560 and Maurin (2002), p. 152.

²⁰³ Cf. Simons 1994, p. 560 and Maurin 2002 on what she calls “generic foundation,” p. 152.

²⁰⁴ Cf. L. A. Paul 2002.

Consider the round lid example again. R cannot exist without L and L is not a part of R.

However, L can exist without R.

In *Principles* I.61, Descartes further articulates his notion of “a mode, properly so called” (p. 213). In particular, he explains what kind of distinction there is (i) between a mode and *its* substance; (ii) between two modes of the same substance; and (iii) two modes of distinct substances. A “modal distinction” holds in cases (i) and (ii). A “real distinction” holds in case (iii). Let us look at each case in turn.

First, Descartes says that the first kind of distinction, between a mode and the substance of which it is a mode, “can be recognized from the fact that we can clearly perceive a substance apart from the mode which we say differs from it, whereas we cannot, conversely, understand the mode apart from the substance” (CSM I, p. 214). Let us illustrate this through an example. Consider a stone that is square-shaped (*ibid.*). Descartes thinks that I cannot clearly understand the shape of the stone “apart from the substance of the stone,” but I can clearly understand the substance of the stone apart from its shape (*ibid.*).

Here it is important to note that Descartes is talking about the *particular shape* the stone has. Otherwise, what he says does not seem to be true. For I *can* understand shape, in general, without this stone, albeit (perhaps) I cannot understand shape, in general, without some substance or other. However, I cannot understand the shape of *this* stone without the stone to which it belongs. Likewise, it seems that I *cannot* understand the substance of the stone, which is an extended body, without some shape or other. But I can understand the substance of the stone without *this* particular shape. So, it seems that a modal distinction holds between a mode and its substance, when we take the mode in question to be a (maximally) *determinate, accidental property* of that substance. For only in that case, what Descartes says seems to apply, namely,

that I can clearly understand the substance without the property, but I cannot understand the property without the substance.

That this is what Descartes has in mind is clear too from a letter he writes to an unknown correspondent in 1645 or 1646, where he also seems to use the term ‘mode’ in its technical sense (CSM III, p. 280). There he distinguishes between “modes, strictly so called” and “attributes”; he characterizes the latter as those properties “without which the things whose attributes they are cannot be” (ibid.). What matters for our purposes is what Descartes says immediately afterwards: “Thus shape and motion are modes, in the strict sense, of corporeal substance; because the same body can exist at one time with one shape and at another with another, now in motion and now at rest; whereas, conversely, neither *this* shape nor *this* motion can exist without *this* body” (emphases mine; ibid.). Note that, in this passage, Descartes expressly says “this shape” and “this motion” to pick out the relevant modes (strictly so called) of the body in question. For a modal distinction between a substance and one of its modes holds only if by ‘modes’ he means the particular, accidental properties that belong to the substance.

I would like to flag two problems, which I will address after a preliminary overview of Descartes’s modal distinction: first, whereas in article 61 of *Principles* I, Descartes merely talks in terms of clearly *understanding* one thing without the other, in the letter just cited, he speaks in terms of one thing *existing* without the other. As I explain below, Descartes thinks that our ability to clearly and distinctly *understand* one thing without the other has *ontological* import: it implies that one thing can *exist* without the other. But that being the case – and this is the second problem – we need to get clear on what exactly is involved in our ability to understand (or not) one thing without the other. As I discuss below, this involves a special kind of mental operation: exclusion.

Concerning the second distinction, between two modes of the same substance, Descartes claims that it “is recognized from the fact that we are able to arrive at knowledge of one mode apart from another, and *vice versa*, whereas we cannot know either mode apart from the substance in which they both inhere” (CSM I, p. 214). Consider, again, the stone: suppose it is square-shaped (as before) and in motion. Descartes argues that “I can understand the square shape without the motion and, conversely, the motion without the square shape” (ibid.). But I cannot understand either the shape or the motion of the stone “apart from the substance of the stone” (ibid.). As I explained above, in order for the latter claim to be true, Descartes must have in mind the particular shape and the particular motion that the stone has at a certain time and place; for in that case alone it would seem to be true that one could not understand the shape (or motion) without the particular substance to which it belongs.

Moreover, in saying that I can, nevertheless, understand the shape apart from the motion, and *vice versa*, Descartes seems to hold that the two modes are distinct (maximally determinate) properties, such that one can exist in a substance without the other. For example, the stone may be square-shaped without being in motion; and the stone may be in motion without being square shaped. (However, neither the square shape of the stone nor its motion can exist at any time without (inhering in) the stone.)

Finally, Descartes holds that the third kind of distinction, between two modes of *different* substances, is a “real distinction” rather than a modal one, as in the previous two cases (CSM I, p. 214). Consider now *two* stones, both moving at the same speed. Descartes argues that the distinction between the motion of stone₁ and the motion of stone₂ is real “since the modes in question cannot be clearly understood apart from the *really distinct* substances of which they are modes” (CSM I 214). So, here the fact that there is a real distinction between the two modes in

question seems to be parasitic on the fact that there is a real distinction between the *substances* to which the two modes belong. In fact, “a real distinction,” strictly speaking, “exists only between two or more *substances*” for Descartes (CSM I, p. 213). And we can recognize such a distinction from the fact that “we can clearly and distinctly understand one [substance] apart from the other” (CSM I, p. 213). Thus, modes of different substances are *really* distinct because they depend for their being on really distinct substances. This suggests that modes cannot have multiple instantiations and are thus particular.²⁰⁵

So: from what Descartes says in *Principles* I.64, we can draw that: modes are maximally determinate, accidental properties of substances, which: cannot exist without their substances, even though their substances can exist without them; are (modally) distinct from other modes of the same substance; and are really distinct from modes of other substances. Thus, modes are tropes, as I defined them above.

On the ontological import of C&D perception

Descartes thinks that our ability to “clearly perceive,” “understand,” or come to know one thing “apart from” another has *ontological* implications. This is evident from what Descartes says in *Principles* I.60, where he explains “what is meant by a ‘real distinction’” (CSM I, p. 213). He begins article 60 by saying: “Now number, *in things themselves*, arises from the distinction between them” (ibid.). He then proceeds to identify three kinds of distinction: real, modal, and conceptual. Concerning the first kind he says: “Strictly speaking, a *real* distinction exists only between two or more substances” (ibid.). Descartes thinks that we can recognize this “simply from the fact that *we can clearly and distinctly understand one apart from the other*” (emphasis

²⁰⁵ Cf. Nolan (1997), p. 170.

mine; *ibid.*). But why should we think that the mere fact that we can “clearly and distinctly understand” one substance apart from the other implies that the two are distinct *in re*?

“For,” Descartes maintains, “when we come to know God, we are certain that he can bring about anything of which we have a distinct understanding” (*ibid.*).²⁰⁶ (Since God is no deceiver, we can trust the “faculty of knowledge” he endowed us with, when we use it properly (*Principles* I.29-30, CSM I, p. 203). But as long as “we assent only to what we clearly and distinctly perceive” we use our intellectual faculty correctly and we “never go wrong” (*Principles* I.43, CSM I, p. 207).) Consequently, Descartes holds that, if I can clearly and distinctly perceive one substance apart from another, they can exist independently from one another, since God can bring about whatever we clearly and distinctly perceive. (In what follows, I simply use “understand” to indicate clear and distinct perception. Descartes himself is not always careful.)

Now let us return to modes. Recall that Descartes thinks that we can recognize a modal distinction between a mode and a substance from the fact that we can’t understand a mode without its substance but we can understand a substance without its mode. This implies that a mode can’t exist without a substance whereas the substance can exist without that mode. (Descartes clearly states this in his letter to an unknown correspondent from 1645/46.)

Let us focus on a mode’s (ontological) dependence on its substance. As Pasnau (2011) and Rozemond (1998) point out, this is a *consequence* of the kind of (diminished) being modes have. Modes *so* exist *that* they depend on substances for their existence. By contrast, substances exist in such a way as to depend on no other (created) substance for their existence; that is, they

²⁰⁶ Also, cf. *Principles* I.29 and 30, in which Descartes says that God is no deceiver and, thus, “everything that we clearly perceive is true” (CSM I, p. 203).

exist through themselves (*per se*). In fact, consider article 64, where Descartes says that what distinguishes a mode from a substance is that substances are “things which [subsist] in their own right” whereas modes exist “in the substances of which they are modes” (*Principles* I.64; CSM I, p. 216).

This might explain why, for Descartes, modes have less perfection or being (*esse*) than (created) substances. Descartes takes the fact that “reality admits of a more or a less,” and that “a substance is more of a thing than a mode,” as “completely self-evident” (*Third Set of Objections with Replies*; CSM II, p. 130). But even though Descartes might not be able to give us a full account of what such a diminished being consists of, he does provide us with a mark, perhaps a necessary and sufficient condition, for picking out the relevant (basic) ontological item: the modal distinction criterion, as explained above.

Since our ability to understand one thing apart from another has ontological import, it’s worth pausing briefly on what this operation consists in for Descartes. In a letter to Gibieuf, dated January 19 1642, Descartes further explains what he means by saying that we cannot understand a shape without the substance whose shape it is. He points out that I may *abstract* the idea of this shape from the idea of the (extended) substance to which such a shape belongs (CSMK III, p. 202). Now, in doing so, I would be focusing my attention on “one part of the contents” of the “richer idea” of the substance in question, while “turning my thought away from” some other part(s) (*ibid.*). (Descartes understands “intellectual abstraction” in terms of selective attention (*ibid.*.) Thus, there is a way in which I *can* think of this shape without thinking of the corresponding substance: I can consider the shape in question “without paying attention” to the substance whose shape it is (*ibid.*).

However, and this is the key claim here, Descartes holds that “it is impossible to *deny* one [idea] of the other *when one thinks of both together*” (emphases mine; *ibid.*). This is precisely the mental operation Descartes has in mind when he says that we cannot *understand* a shape *without* its substance. (I shall follow D. Murdoch (1993) and Nolan (1997), in calling this operation “exclusion.”²⁰⁷) In particular, Descartes claims that “it is impossible to conceive a shape while denying it has an extension,” and “to conceive an extension while denying that it is the extension of a substance” (CSMK III, p. 202). So, being able to understand one idea without another involves, first, thinking about the two ideas *together*; second, being able to *deny* one idea of the other.

To use a different example, consider my thought that it is 9:30 am right now. Can I understand this thought without the substance to which it belongs, i.e., my mind? It seems not. For it seems that I cannot mentally “exclude” the idea of my mind from the idea of my thought. First, I consider my thought and my mind together. Second, I ask whether I can *deny* the idea of my mind from the idea of my thought. Now, it seems impossible to conceive this thought without the thinking which constitutes the nature of my mind (CSMK III, p. 203). Thus, I cannot *understand* my thought without my mind.

On the contrary, it seems that I *can* understand my mind without this thought here. For it is possible to conceive my mind while denying that it has *this* thought, although (perhaps) not denying that it has any thoughts. (Descartes holds that “the soul is always thinking,” since thinking is the nature of the soul, or mind, and “whatever constitutes the nature of a thing always belongs to it as long as it exists” (CSMK III, p. 203).) This shows that my thought that it is 9:30

²⁰⁷ As Murdoch points out in his (1993), Descartes distinguishes the mental operation of “exclusion” from “abstraction” in a letter to Mesland of 2 May 1644 (CSMK III, p. 236).

am right now is a *mode* of my mind. For, by the modal distinction criterion I discussed above, I can recognize this from the fact that I cannot understand the thought without the substance to which it belongs but I can understand the substance without the thought. The same applies to a shape and the body whose shape it is.

Here I'd like to draw attention to the key role the properties of extension and thinking, respectively, play in explaining why I cannot conceive of a shape without its substance, i.e. a body, and why I cannot conceive of my thought without its substance, i.e. a mind. To wit: I cannot understand some (particular) shape without the body to which it belongs, according to Descartes, because it is impossible to “deny that it [i.e. the shape] has an *extension*” and I cannot understand “an extension” without the substance to which it belongs (CSMK III, p. 202). Likewise, I cannot understand some (particular) thought I am having without my mind, precisely because my mind is a *thinking* substance. Indeed, extension and thought have a special status among properties of substances, according to Descartes: “extension” is the “principal attribute” of “corporeal substance,” or body; “thought” is the main attribute of “thinking substance,” or mind (*Principles* I.53, CSM I, p. 210).

It's worth noting that views of accidents as modes, such as Descartes' and Oresme's (as discussed in Part III), are especially unappealing for contemporary philosophers. For by positing that accidents, such as qualities, exist in a way that is distinct from, yet essentially dependent upon, substances, they assume that there are different ways of being. But this view is often dismissed as mysterious and incoherent by contemporary metaphysicians.²⁰⁸ Yet, as the debate I sketched in section I shows, there seem to be important philosophical reasons in support of this

²⁰⁸ Cf. Kris McDaniel, “Ways of Being,” *Metametaphysics* (2009), 290–319; “A Return to the Analogy of Being,” *Philosophy and Phenomenological Research* 81 (2010): 688–717; “Being and Almost Nothingness,” *Noûs* 44 (2010).

view, at least within the context of Aristotelian metaphysics. By (essentially) distinguishing accidents from substances, such a view avoids the problem of treating accidents as substances. This helps us understand the motivations behind this view and suggests one important reason why such a view of accidents is attractive to philosophers such as Oresme and Descartes despite its dangerous theological implications.

Descartes on the Eucharist

Remarkably, the doctrine of the Eucharist remains a problem for Descartes (as it was for Oresme).²⁰⁹ Various of his correspondents asked how, on his view of qualities, the miracle of the Eucharist should be understood. Indeed, the perceived implications of his views for this miracle played a central role in the persecution of his views in France after his death and contributed significantly to his works being placed on the Index of 1663.²¹⁰ In the *Fourth Set of Replies*, Descartes sums up Arnauld's objection as follows:

There remains the sacrament of the Eucharist, with which M. Arnauld believes my views are in conflict. He says: 'We believe on faith that the substance of the bread is taken away from the bread of the Eucharist and only the accidents remain'; and he thinks that I do not admit that there are any real accidents but recognize only modes which are unintelligible apart from some substance for them to inhere in, and hence that they cannot exist without a substance. (*Fourth Set of Replies*; CSM II, p. 173).²¹¹

²⁰⁹ Rozemond 1998, p. 107.

²¹⁰ Ibid.

²¹¹ Here's the objection in Arnauld's words: "But what I see as likely to give the *greatest offence to theologians* is that according to the author's doctrines it seems that the Church's teaching concerning the sacred mysteries of the Eucharist cannot remain completely intact. We believe on faith that the substance of the bread is taken away from the bread of the Eucharist and only the accidents remain. These are extension, shape, colour, smell, taste, and other qualities perceived by the senses. But the author thinks there are no sensible qualities, but merely various motions in the bodies that surround us which enable us to perceive the various impressions which we subsequently call 'colour,' 'taste' and 'smell.' Hence only shape, extension, and mobility remain. Yet the author denies that these powers are intelligible apart from some substance for them to inhere in, and hence he holds that they cannot exist without such a substance. (emphasis mine; *Fourth Set of Objections*; CSM II, pp. 152-153).

Briefly, here's why Descartes' view of modes seems to conflict with the doctrine of the Eucharist. As Arnauld mentions, according to this doctrine, after the consecration of the bread and wine, the accidents of the bread and wine remain without inhering in a (substantial) subject. But Descartes denies the existence of "real accidents," that is, accidents that are *res* and can therefore exist separately from any other subject, as I explained above. Rather, Descartes recognizes only modes, which cannot exist without their substance. And this is incompatible with transubstantiation.

Conclusion

We are now ready to examine Descartes' theory of material substance and quantity against the late medieval, Scholastic backdrop. How would Descartes answer questions I and II, provided in the Introduction, namely, (I) what is the relation between material substance and quantity? (II) What is the ontological status of quantity? Since Descartes holds that quantity, or extension, is the nature of material substance, he does not think that a material substance can exist without it. In fact, extension is the main attribute of corporeal substance. Descartes defines an attribute as a property of a substance without which the substance whose attribute it is cannot exist. So, extension is essential to material substance. In fact, Descartes explicitly attacks the Scholastic view, according to which quantity is an accident of material substance. (Note that by 'accident' here Descartes means 'real accident,' so the target of his attack is a view of quantity such as Buridan's.) Moreover, Descartes holds that the extension of a body is invariable and intrinsic to that body. These are features of attributes, using the technical notion of this term.

What about the ontological status of extension? If extension is "nothing else" but corporeal substance, then Descartes would seem to hold the first view among the three that

Oresme describes in QP IV.15, namely, the view according to which extension is identical to substance. As such, extension would be a *res*. By contrast, qualities such as shape or motion are modes of corporeal substance.

How does Descartes' view of extension compare to the theories of quantity of each of our three authors? Like Ockham and Oresme, Descartes denies that there is a real distinction between a material substance and its quantity. These three thinkers *agree* that quantity is not some *res* that is really distinct and separable from material substance. That is, they reject Buridan's realism about quantity (discussed in Part II of this dissertation). However, Descartes does seem to think that quantity is a *res*: it is "nothing but" the substance itself. So, like Buridan, Descartes assigns strong ontological status to quantity. But unlike Ockham, Buridan, and Oresme, Descartes holds that the extension of a body is an *invariable* and *essential* feature of it. For, first, Descartes denies the possibility of C/R, strictly understood, on the Scholastic view. As a result, he is able to do what Ockham tries to but cannot actually do: to explain C/R mechanistically. But Descartes' theory of extension and modes conflicts with transubstantiation, one important theological motivation behind our three late medieval authors' views of material substance and quantity.

APPENDIX

OCKHAM ON CONDENSATION AND RAREFACTION IN *REPORTATIO IV.6*

In this Appendix, my goal is to reconstruct and critically examine an interesting yet (so far) often overlooked argument in *Reportatio IV.6* which appeals to the natural phenomenon of C/R to show that, in the sacrament of the Eucharist, the body of Christ can be under the (qualities of the) host holenermerically, that is, “whole in the whole place and whole in any part of that place.” In particular, Ockham sets forth this argument to address one of the two key problems connected with the idea of a material substance existing holenermerically in a place, namely, the problem of the co-location of all of its parts. I examined Ockham’s doctrine of the real presence of Christ’s body in the Eucharist in Chapter 2. Here I will briefly sum up some of Ockham’s key claims in connection with this doctrine and then focus on his C/R argument.

What matters for my purposes is that this argument seems to imply that, in Ockham’s view, C/R involves the co-location of (some) parts of a body. If this is right, then it would seem that Ockham allows for the integral parts of a material substance to be co-located naturally. But this conflicts with several claims Ockham makes in his natural works, where he seems to explicitly *deny* that the integral parts of an extended material substance can exist in the same place at the same time under normal circumstances.

In *Reportatio IV*, q. 6, Ockham maintains that, in the sacrament of the Eucharist, when the priest blesses the host, the body of Christ comes to be really present in the circular place where the (physical) qualities of the bread are (without inhering in the substance of the bread). In particular, Ockham holds that the body of Christ is under the accidents of the (consecrated) bread holenermerically, that is, as the human soul was thought to be in the human body. To show that it is metaphysically possible for a material substance, such as Christ’s body, to exist in this way,

Ockham offers the following line of reasoning: just as it is possible for an indivisible immaterial substance to exist holenmerically, as the soul is in the body, so it is possible for a *divisible* material substance, such as Christ's body (OTh VII, p. 79). (For a detailed discussion of this argument, see Chapter 2 above.)

However, Ockham raises two "difficulties" in connection with the idea of a *divisible* material substance existing holenmerically in a place. First, if the body of Christ were to exist holenmerically under the (consecrated) host, then numerically the same body would exist in several places, at the same time. (This is the problem of multiple location of one and the same body.) Second, Christ's holenmeric placement under the host would imply that all of its parts would come to (co)exist in one and the same place. For the whole body of Christ would come to exist in any part of the (circular) place occupied by (the accidents of) the host.²¹² Briefly, Ockham addresses the first problem by saying that, since we accept the holenmerism of the soul, then we already accept that one and the same body can exist in different (continuous and discontinuous) places at the same time. And this is no more of a problem for a material substance. Here I focus on the second problem. It is to address this (second) "difficulty" that Ockham appeals to the phenomenon of C/R.

Ockham's C/R argument in Reportatio IV.6

The argument goes as follows. (P1) If something divisible can (at least by divine power) be *simul* "as all of its parts" (*secundum omnes suas partes*), then it can exist whole, e.g. as all of its parts,

²¹² *Itaque dico quod ad videndum quo modo corpus Christi existit sub specie panis apparent duo difficultates. Una, quo modo idem corpus numero potest coexistere pluribus secundum se totum. Alia quo modo multae partes possunt coexistere uni loco. Et qui videret perfecte ista duo, videret quo modo corpus Christi existit sub specie panis, ita quod totum sub tota et totum sub qualibet parte* (emphases mine; OTh VII, p. 79).

in the whole place and in any part of the place that the host occupies.²¹³ (P2) Christ's body can be *simul* as all of its parts. Therefore, Christ's body can exist whole (as all of its parts) in the whole place and in any part of the place. Now, P2 is the problematic premise. To support this claim, Ockham argues: naturally (*naturaliter*) some parts that at first are distant from one another can come to be *simul*: that is parts that at first existed in several places now exist in one place. For: when a body condenses, the parts of that body that at first existed in several parts of its original place, now exist in one part of its original place. So, he concludes, surely, *all* parts of a body that at first were distant can come to be *simul*, at least by divine power.²¹⁴

Let us look at an example. Consider one of the trees (T) outside my window. Suppose that T has three parts: T1 (roots), T2 (trunk), and T3 (branches). Also, suppose that: T occupies some place P (shaped exactly as the tree); P is divided into three parts P1, P2, P3; and T1 exists in P1, T2 exists in P2, and T3 exists in P3. If T were to *condense*, some of T's parts, which at first existed in different places, would now come to be located in the same place. E.g., T1 and T2 might come to be located in P1.²¹⁵

²¹³ Here I follow Adams (2010) in understanding 'x is not repugnant to y' as 'x is metaphysically possible for y.'

²¹⁴ *Praeterea, cuicumque divisibili non repugnat esse simul secundum omnes suas partes, ei non repugnat coexistere alicui toti secundum se totum et secundum omnes suas partes. Sed corpori Christi non repugnat esse simul secundum omnes suas partes. Tum quia naturaliter possunt aliquae partes primo distantes esse simul, sic quod illae partes quae prius coexistebant pluribus locis nunc coexistant uni loco. Patet hoc quando de raro fit densum, partes rari quae prius coexistebant pluribus partibus loci nunc coexistunt uni parti, sicut post patebit. Tum quia non est maior difficultas quod duae partes corporis sint simul quam quod duo corpora sint simul; sed unum potest fieri per potentiam Dei, igitur aliud.* (emphases mine; OTh VII, pp. 78-79).

²¹⁵ Cf. Reportatio IV, q. 9, art III: *Ita quod rarefieri et condensari nihil aliud est quam quod aliquod corpus per virtutem creatam aliquando occupat maiorem locum, aliquando minorem, sine omni absoluto de novo adveniente. Ita quod raritas nihil aliud dicit nisi extensionem partium alicuius corporis et coexistentiam pluribus partibus loci quam prius; ita quod hoc nomen 'raritas' vel conceptus significat ipsam substantiam vel qualitatem principaliter, sicut quantitas, et connotat multas alias res vel partes loci quibus partes corporis rari coexistunt et nullam aliam rem dicit. 'Densitas' autem e converso significat eandem substantiam et qualitatem principaliter et connotat coexistentiam earundem partium quae prius coexistebant pluribus partibus loci nunc coexistere paucioribus partibus loci. Ita quod prius tres partes forte corporis rari coexistebant tribus partibus loci, nunc autem in denso illae tres partes eadem numero coexistunt uni parti loci. [...] Unde secundum istam viam, quando de raro fit densum, illae tres partes prius coexistentes tribus partibus loci nunc moventur localiter per condensationem ad minorem locum et coexistunt tantum uni parti eiusdem loci vel alterius. Quando autem e contra de denso fit rarum,*

Now, what does “being *simul*” amount to? Before we answer this question, it’s worth keeping in mind two key facts: first, that a condensed or rarefied body is still extended; second, that in the Eucharist, Christ’s body is *not* extended, that is, it *lacks* “*partem extra partem*” structure.²¹⁶ Consider two models of ‘being *simul*’ based on two different interpretation of Ockham’s theory of C/R: a co-location model and a crowding model, using Pasnau (2011)’s terminology. On the co-location (or overlap) model, when two parts come to be *simul*, they come to exist in the same place at the same time; they thus *inter-penetrate*.²¹⁷ By contrast, on the crowding model, when two parts come to be *simul*, they simply come to “crowd” a smaller place. It seems that whereas the crowding model is compatible with extension, the overlap model is not. For: if (at least) some parts of a body overlap, then that body is not extended.²¹⁸ Ockham explicitly states that if a body is in a place “quantitatively”, then it has “*partem extra partem*,” e.g. “where one part is, another [part] is not”; and the whole body is in the whole place and each part of the body is in each part of the place “precisely,” that is, in such a way that each part of the body exist in one part of the place but not in another (OTh VII, p. 80).²¹⁹

So, here is the problem with Ockham’s C/R argument laid out above. Either C/R involves the co-location of (some) parts or it does not. If it does, then Ockham’s argument seems to work.

tunc illae tres partes nunc coexistentes uni parti loci, per rarefactionem coexistunt tribus partibus loci, et sic moventur localiter ad maiorem locum. (emphasis mine; OTh VII, pp. 174-175)

²¹⁶ *Et quando substantia vel qualitas sic coexistit loco quod totum coexistit toti et pars parti praecise, ita uni quod non alteri, tunc dicitur substantia vel qualitas quantitas.... Quando autem sic coexistit loco quod totum coexistit toti et totum cuilibet parti, tunc non dicitur quantitas nec quanta.* (emphasis mine; OTh VII, p. 73).

²¹⁷ Adams (2010) and Roques (2016) interpret Ockham as defending an overlap theory of C/R.

²¹⁸ *Et secundum istum modum ponendi potest salvari dictum: quomodo est ibi corpus Christi non habens modum quantitativum. Quia nec est ibi quantitative nec circumscriptive, quia si sic, tunc haberet partem extra partem et ubi una pars esset, alia non esset; et totum coexisteret toti et pars parti precise uni, ita quod non alteri. Sed non sic existit sub speciebus panis, sed sic quod totum corpus Christi existit sub tota hostia et totum sub qualibet parte....* (emphasis mine; OTh VII, pp. 80-81).

²¹⁹ See the passage cited in footnote 218. Also see: “*Et quando substantia vel qualitas sic coexistit loco quod totum coexistit toti et pars parti praecise, ita uni quod non alteri, tunc dicitur substantia vel qualitas quantitas.... Quando autem sic coexistit loco quod totum coexistit toti et totum cuilibet parti, tunc non dicitur quantitas nec quanta.* (emphasis mine; OTh VII, p. 73).

It shows *how* some parts of a body come to overlap naturally. And, surely, God can cause *all* parts of a body to overlap. In fact, that this is what Ockham seems to mean by ‘being *simul*’ is further supported by what he says right after his appeal to C/R. Ockham argues that “it is no greater difficulty for two parts to be *simul* than for two bodies to be *simul*; but one can happen by the power of God, so can the other” (ibid. p. 79). Here the idea is that two bodies can exist at the same time *in the same place* by divine power, e.g. Jesus entering the closed doors, his coming out of the closed womb of the Virgin, etc.

However, by Ockham’s account of extension in *Reportatio* IV, q. 6, it would seem that a condensed body would no longer be extended. For, here Ockham seems to say that, if a body is extended, then *none of its parts* overlap. Also, as I show below, this conflicts with what Ockham says in his natural works, where he denies that bodies (and parts thereof) can be co-located.

By contrast, if C/R does *not* involve the co-location of (some) parts, then a condensed body would still count as extended, by Ockham’s account of extension in *Rep* IV, q. 6.

Specifically, here one might think that when a body condenses, (some of) its parts come to be “crowded,” so to speak, in a smaller place without overlapping.²²⁰ But then his argument here

²²⁰ This is what Robert Pasnau suggested to me in conversation. He believes that this is what Ockham has in mind later in the same text, namely, *Reportatio* IV, q. 9. In email correspondence, Pasnau argues that the following passage can be read according to his “crowding” model: “So to be rarefied and to be condensed is nothing other than for some body, by some created power, to occupy sometimes a greater place, sometimes a smaller place, without any absolute thing being added anew. Thus, rarity doesn’t indicate anything else except the extension of parts of some body and [their] existence in more parts of place than before. So, this name, ‘rarity,’ or concept signifies the substance itself or quality principally, as quantity does, and connotes many other things (*res*) or parts of place in which the parts of a rare body exist, and it doesn’t convey anything else. ‘Density,’ by contrast, signifies the same substance and quality principally and connotes the existence of the same parts that previously existed in more parts of a place and now exist in fewer parts of place. To illustrate: consider three parts of a rare body that at first exist in three parts of a place; but now, in the dense [body], numerically the same three parts, exist in one part of [the original] place. [...] Thus, according to this opinion [namely, Ockham’s], when a rare body condenses, the three parts that at first existed in three parts of a place now are locally moved in virtue of condensation to a smaller place and exist only in one part of the same place or of some other place. When, on the contrary, a dense body rarefies, then those three parts that now exist in one part of place, in virtue of rarefaction exist in three parts of that place, and thus they are locally moved to a bigger place (my translation; OTh VII, pp. 174-175). (See fn. 215 for the Latin text.)

does not seem to work. In fact, his C/R argument would seem to be bad, possibly equivocating between two senses of “being *simul*”: overlapping vs. crowding. Moreover: it seems difficult to see how “crowding” amounts to being *simul* at all. Still, if this is right, then the kind of being *simul* involved in C/R is fundamentally different from the kind of being *simul* involved in the Eucharist. Moreover, the phenomenon of C/R doesn’t help us explain how a material substance, such as Christ’s body, can exist holonmerically.

So: it seems that we are left with two unpalatable options: (a) accepting the co-location of bodies under natural circumstances (and, possibly, a revised notion of extension); or (b) pinning Ockham with a bad argument and thereby violating the principle of charity in interpreting this text. I lean towards (b). For Ockham seems to clearly *deny* that material substances and their integral parts can (physically) inter-penetrate in his natural works. For example, in *Summula* I.13 Ockham states that “the parts of matter can never be in the same place”; and that “quantity, or extension is nothing except the distance of one part from another.”²²¹ (By ‘distance of one part from another’ Ockham here means parts that are not overlapping, based on the immediately preceding sentence.). Moreover, Buridan and Oresme agree with Ockham on this as well. They all seem to think that when a body condenses its parts become *smaller* and thereby come to

²²¹ *Summula* I.13: “*Dictum est supra in praecedenti capitulo quod materia est extensa, ideo videndum est quomodo materia se habeat ad extensionem.... Sciendum est autem quod quamvis haec sit per accidens ‘materia est extensa’, distinguendo ‘per accidens’ contra ‘per se primo modo,’ tamen haec est necessaria et semper vera et per secundo modo, quia impossibile est quod sit materia sine extensione: non enim est possibile quod materia sit nisi habeat partem distantem a parte. Unde quamvis partes materiae possint uniri ad modum quo partes aquae et aeris possunt uniri, tamen numquam partes materiae possunt esse in eodem loco. Et ideo semper materia habet partem distantem a parte, et hoc est materia esse extensam et quantam vel dimensionatam, quia dimensio, quantitas, sive extensio non est nisi distantia unius partis ab alia*” (emphasis mine; OPh VI p. 191). Also, cf. In Phys IV, chapter 17, section 10: *Sic ergo patet quod secundum intentionem Philosophi non oportet ponere talem rem mediam inter substantiam et qualitates. Quia potest salvari quod substantia sit quanta et una maior quam alia et quod sit longa, lata, et profunda per hoc solum quod habet partes substantiales distinctas realiter quae non sunt simul, et quarum aliquae minus approximantur quam aliae, et quod inter eas non est aliquod medium*” (OPh V, p. 184).

occupy a smaller place. By contrast, when a body rarefies, its parts expand so as to occupy a bigger place. Thus, I do not think that Ockham subscribes to an overlap theory of C/R (*contra* Adams 2010 and Roques 2016).

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