

*Cartesian Meteors and Scholastic Meteors:
Descartes against the School in 1637*

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Descartes's rejection of real qualities is a hallmark of his anti-scholastic rhetoric. While he initially avoided expressing an outright rejection of real accidents, mainly for theological concerns, the discussion breaks into the open in the *Replies* to the *Meditations* of 1641. According to this text, Descartes's argument against Aristotelian hylomorphism proceeded from his commitment to the real distinction between body and mind. His most famous critique against the *entia philosophica* that populate scholastic physics—qualities and substantial forms—is that these concepts arise from a deep-rooted prejudice: the Aristotelians confuse things that pertain to the mind with things that pertain to the body and thus falsely attribute affections of the mind to material bodies.

However, it is difficult to assign this line of argument to the corpus prior to the *Meditations*, while Descartes's rejection of Aristotelian real qualities is manifest throughout his earlier writings. This essay presents Descartes's anti-hylomorphism in *The Meteors* published in 1637 and in the unpublished works that precede it, *The World (Treatise on Light)* and the *Rules for the Direction of the Mind*.

In the first section, I retrace the project and the reception of the *Meteors*, in order to establish that one of the central points of conflict between Descartes and his scholastic readers was the ontological status of real qualities. In *The Meteors*, Descartes wanted to publish a sample of non-scholastic physics that uses mechanical explanations instead of hylomorphic notions. In spite of Descartes's statements that he did not want to

openly provoke the School, I take Descartes's rejection of real qualities to be an underlying motivation for the publication of *The Meteors*. I emphasize the gravity of Descartes's position by establishing the central role that the real qualities play in contemporary Aristotelian meteorology.

In the second section, I present Descartes's arguments against real qualities in *The World* and in the *Rules for the Direction of the Mind*, connecting them with the more famous argument provided in the *Sixth Set of Replies*. I claim that Descartes's nominalist position with respect to the accidents of the *res extensa* is decided very early, on epistemological grounds, before the metaphysical elaboration of the thesis of the real distinction of substances from the *Meditations*. I take this priority to be both historical and conceptual. I conclude that Descartes's preoccupation with the nominalist reduction of real qualities is an essential part of the development of his early physics.¹

I. THE METEORS AND REAL QUALITIES

Compared with other pieces of the Cartesian corpus, *The Meteors* have drawn less attention from scholars. Most of the scholarship on *The Meteors* has been devoted to *Discourse VIII* on the rainbow and to problems of scientific methodology.² Nevertheless, Descartes himself thought of his

¹ On the notion of real qualities, see Stephen Menn, "The Greatest Stumbling Block: Descartes' Denial of Real Qualities," in *Descartes and His Contemporaries: Meditations, Objections, and Replies*, ed. Roger Ariew and Marjorie Glicksman Grene (Chicago: University of Chicago Press, 1995), 182–207. On the historical development of accident realism, see Robert Pasnau, *Metaphysical themes, 1274–1671* (Oxford: Oxford University Press, 2011), 190–204 et passim. References to Descartes's texts are given as follows: "AT" = *Cœuvres de Descartes*, 12 vols., ed. Charles Adam and Paul Tannery (Paris: Vrin, 1964–71); "CSM" = *The Philosophical Writings of Descartes*, trans. John Cottingham, Robert Stoothoff, and Dugald Murdoch (Cambridge: Cambridge University Press, 1984–85); "Olscamp" = *Discourse on Method, Optics, Geometry, and Meteorology*, trans. Paul Olscamp (Indianapolis: Hackett, 2001). Where not indicated otherwise, translations are mine.

² Paul Mouy, "La théorie cartésienne de l'arc-en-ciel: ses origines, son développement," *Travaux du IXe congrès international de philosophie. Congrès Descartes* (Paris: Hermann, 1937), 2: 47–53; C. B. Boyer, "Descartes and the radius of the rainbow," *Isis* 43 (1952): 95–98; Jean-Robert Armogathe, "L'Arc-en-ciel dans les *Météores*," in *Le Discours et sa méthode*, ed. Nicolas Grimaldi and Jean-Luc Marion (Paris: Presses Universitaires de France, 1987), 145–62; Daniel Garber, "Descartes and Experiment in the *Discourse* and *Essays*," in *Essays on the Philosophy and Science of René Descartes*, ed. Stephen Voss (New York: Oxford University Press, 1993), 288–310; Michel Blay, *Les figures de l'arc-en-ciel* (Paris: Carré, 1995) and his introduction to *The Meteors* in Descartes, *Cœuvres complètes* (Paris: Gallimard, 2009), 3: 265–83; Jed Z. Buchwald, "Descartes's Experimental Journey Past the Prism and Through the Invisible World to the Rainbow," *Annals of Science* 65 (2008): 1–46.

work as providing a revolutionary step forward with respect to the contemporary meteorological treatises available. More importantly, *The Meteors* constitute a large part of the first public presentation of Descartes's physics in the *Essays* of 1637. Etienne Gilson's 1920 article, "Météores cartésiens et météores scholastiques," remains the only thorough study devoted to the content of *The Meteors* in general.³ Following Gilson's lead, this section seeks to provide a historical assessment of *The Meteors*, both with respect to contemporary meteorological knowledge and with respect to the development of Descartes's thought.⁴

An Unwelcomed Book

Descartes's interest in the meteors was triggered by one unusual phenomenon, the parhelia observed in Rome in 1628 by Christoph Scheiner. Descartes thought at that time to make a "small treatise" that would examine not only optical phenomena, but also "in general all sublunary phenomena."⁵ The project extended to a treatise on light (presumably *The World*) that would comprehend *all* natural knowledge.⁶ In 1635, after *The World* was abandoned, *The Meteors* is presented as a single work.⁷ The essay was published in 1637 as "a sample of philosophy"⁸ among others, together with *The Discourse*, *The Dioptrics*, and *The Geometry*. The structure of the essay follows that of contemporary textbooks and Descartes respected, to a large extent, the order of topics normally used.⁹ In the correspondence,

³ *Études sur le rôle de la pensée médiévale dans la formation du système cartésien* (Paris: Vrin, 1930), 102–37 (initially published in 1920–21 in *Revue d'Histoire de la Philosophie*). Gilson should be completed with E. Lojaco's edition and notes of *The Meteors* in Descartes, *Opere scientifiche*, vol. 2 (Torino: UTET, 1983).

⁴ For the bibliography of the history of meteorology, see esp. Gustav Hellmann, "The Dawn of Meteorology," *Quarterly Journal of the Royal Meteorological Society* 34 (1908): 223–27; and volume 2 of his *Beiträge zur Geschichte der Meteorologie* (Berlin: Veröffentlichungen des Königlich Preussischen Meteorologischen Instituts, 1917), which includes a bibliography of Aristotelian commentaries to the *Meteorologica*. For the Jesuit context, see François de Dainville, *La géographie des humanistes* (Paris: Beauchesne, 1940); for Renaissance authors, see Craig Martin, *Renaissance Meteorology from Pomponazzi to Descartes* (Baltimore: Johns Hopkins University Press, 2011).

⁵ AT I 23.

⁶ AT I 70.

⁷ AT I 329–30.

⁸ AT I 23.

⁹ See AT XII 204–5 (quoting summaries of books by Eustachius a Sancto-Paolo and d'Abra de Raconis); Étienne Gilson, "Météores cartésiens et météores scholastiques" (a comparison with the Conimbricenses); Jean-Robert Armogathe, "L'Arc-en-ciel dans les Météores," 159–62 (a comparative table between the Conimbricenses, Descartes and Fromondus).

he presented the work as a possible replacement for the teaching manuals on meteorology, especially those taught in the Jesuit schools.¹⁰

After the *Essays* of 1637 were published, Descartes sought the approval of the Jesuits, in a campaign that prefigures the one he carried out, on a larger scale, for the *Meditations* (although the outcome was much different; Descartes gave up plans to publish this first exchange with the learned community). He tried to use Father Noël as a promoter that would show around his treatise in the Society and would send him back comments from members.¹¹ In his letter to him, Descartes insisted on *The Meteors*: “particularly for *The Meteors*, I don’t know how they will teach it from now on, as they do each year in your establishments, without either refuting or following what I write on this subject.”¹² At one point, not receiving the enthusiasm he was expecting, Descartes asked Mersenne to enquire about the disputations that the Jesuits were holding, in order to see if they had discussed his book.¹³ He sent further copies to Father Vatier; Father Ciermans of the Society in Leuven wrote back to him extensively on colors and on his account of the rainbow; another one of his former teachers from La Flèche, Father Fournier, showed some enthusiasm for the work, which extended even to what we would now call plagiarism. But the general reception in Jesuit circles was underwhelming.¹⁴ Father Ciermans congratulated Descartes for being a pioneer of a new world in meteorology by rejecting real qualities, although in the end he also questioned this radicalism.¹⁵

Descartes was soon disenchanted by the lack of enthusiasm from the Jesuits. He wrote to Huygens (in a passage that was left out from the letter sent) that the book was perhaps too much for the School:

As for my book, I don’t know what opinion the general public [*gens du monde*] will have on it; but in what regards the Schoolmen, I understand that they keep silent, and, bothered by the fact

¹⁰ See Étienne Gilson, *La liberté chez Descartes et la théologie* (Paris: F. Alcan, 1913), 319–32, on Descartes’s attempt of introducing his philosophy in the Jesuit colleges.

¹¹ AT I 383.

¹² AT I 455.

¹³ AT II 267–68.

¹⁴ See Geneviève Rodis-Lewis, “L’accueil fait aux *Météores*,” in *Problématique et réception du Discours de la méthode et des Essais*, ed. Henry Méchoulan (Paris: Vrin, 1988), 99–108; Roger Ariew, “The first attempts at a Cartesian scholasticism: Descartes’ correspondence with the Jesuits of La Flèche,” in *La biografia intellettuale de René Descartes attraverso la Correspondance*, ed. Jean-Robert Armogathe, G. Belgioioso, C. Vinti (Naples: Vivarium, 1999), 263–86.

¹⁵ AT II 55–56 and 59.

that they don't find in it enough ground to exercise their arguments, they limit themselves to say that, if what it contains were true, than all their philosophy would have to be false.¹⁶

A long dispute with Father Bourdin, started in 1639, precipitated the end of this campaign, and at one point Descartes accused Bourdin for being directly responsible for the failure of his *Meteors*.¹⁷ When publishing the *Meditations*, Descartes changed tactics and decided to exploit the rivalry between the Society and the Sorbonne (though without much success). The Jesuit reception suggests that the *Meteors* were perhaps more provoking than Descartes presented them to be.

The main objection raised against the *Meteors* was the lack of proper demonstrations or experiments. But there was also a polemical dimension in the book that could have triggered the reserve of an Aristotelian natural philosopher. After his hopes of having the book accepted by the Jesuits were dashed, Descartes recognized publicly in the *Lettre-Préface* to the French *Principes* that “in the *Meteorology* I wanted people to recognize the difference that exists between the philosophy I practice and that which is taught in the Schools, where the same subject matter is normally dealt with.”¹⁸

This polemical dimension is transparent throughout the essay, but one of the most important innovations of the treatise is an open rejection of the scholastic distinction between perfect and imperfect mixtures. Descartes wrote in *Discourse I*:

I shall take the opportunity to pause a little and describe salt, and to see if in it we can ascertain the form of these bodies that the philosophers hold to be composed of a perfect mixture of the elements, as well as those of the meteors, which they say are composed of the elements in an imperfect mixture.¹⁹

This text marks a direct opposition with “the Philosophers.” Descartes will never look for the forms of bodies, quite the contrary. The theory of mixtures is fundamental for any Aristotelian account of body and matter, not to mention particular sciences such as alchemy or medicine. Moreover, the

¹⁶ AT II 48: “Pour mon livre, je ne sais quelle opinion auront de lui les gens du monde; mais pour ceux de l'Ecole, j'entends qu'ils se taisent, et que fâchés de n'y trouver pas assez de prise pour exercer leurs arguments, ils se contentent de dire que, si ce qu'il contient était vrai, il faudrait que toute leur philosophie fût fausse.”

¹⁷ AT VII 573. On Bourdin, see Roger Ariew, “Pierre Bourdin and the Seventh Objections,” in *Descartes and His Contemporaries*, 208–25.

¹⁸ CSM I 187 (AT IX–2 15).

¹⁹ Olscamp, 263.

distinction between imperfect mixtures (aggregates) and perfect mixtures (endowed with true substantial unity) is omnipresent in contemporary textbooks from the first pages. A look into the way in which the concept was used in meteorology will highlight the gravity of Descartes's rejection of this particular notion.

One reference for Descartes's *Meteors* was a book written by Libertus Fromondus, who is also the first reader to have given thoughtful comments on the *Essays*. Fromondus (1587–1653) was a professor of Scripture in Leuven and a respected man of science, author of Aristotelian textbooks and polemical tracts. Jean-Robert Armogathe has suggested that Descartes's treatment of the rainbow in *Discours VIII* may have been inspired by Fromondus's and that he used this book for empirical material.²⁰ Fromondus's *Meteors* was in its day an influential summa of meteorological knowledge of the kind that Descartes aimed to replace.²¹

Fromondus gives the following definition:

The Philosophers however define their meteor as an imperfectly mixed body, raised in the air out of a vapor or out of an exhalation. [. . .] The imperfect body is nothing else than an Element corrupted by foreign qualities. Such as heated water, ice, snow, hail, etc. [. . .] Therefore this imperfect mixture is a union (*coniunctio*) of a foreign quality with a natural quality in their element. [. . .] In this a way, namely, the mixture of four degrees of heat with four degrees of cold makes warm water an imperfect mixture. This mixture is called imperfect because it does not attain the perfection of the proper mixture [*temperies*], which drives out the substantial form of the element and introduces perfectly the form of the mixed body.²²

²⁰ Jean-Robert Armogathe, "L'Arc-en-ciel dans les *Météores*."

²¹ Libertus Fromondus, *Meteorologicorum libri sex* (Antwerp: 1627; Leuven: 1646 and three editions in England, Oxford: 1639, London: 1656 and 1670). On Fromondus, see Antonio Favaro, "Gli oppositori di Galileo. Il Liberto Froidmont," *Atti del Reale Istituto Veneto di scienze, lettere ed arti* 7 (1893): 731–45; Lucien Ceysens, "Le janséniste Libert Froidmont," in *Jansenistica minora* (Malines: Ed. Saint-François, 1964), 8: 1–6; Daniel Garber, "Descartes, The Aristotelians, and The Revolution That Did Not Happen In 1637," *The Monist* 71 (1988): 471–86; Christoph Meinel, "Les *Météores* de Froidmont et les *Météores* de Descartes," in *Libert Froidmont et les résistances aux révolutions scientifiques*, ed. A.-C. Bernès (Haccourt: Association des vieilles familles de Haccourt, 1988), 105–29; Isabelle Pantin, "Libert Froidmont et Galilée: L'impossible dialogue," in *Largo Campo di Filosofare. Eurosymposium Galileo 2001*, ed. J. Montesinos and C. Solis (Tenerife: La Orotava, 2001), 615–35.

²² *Meteorologicorum libri sex* (1627), 1–2: "Philosophi vero Meteorum suum definiunt, Corpus imperfecte mixtum, ex vapore vel exhalatione ortum in sublimi. [. . .] Corpus imperfecte mixtum, nihil aliud est, quam Elementum infectum qualitatibus peregrinis. Talis aqua calefacta, glacies, nix, grando, &c. [. . .] Mixtio igitur imperfecta hîc, est

Fromondus's definition is based a qualitative distinction in the composition of matter that Descartes rejected. Imperfect mixtures are sublunary bodies that have not yet acquired a substantial form of their own, unlike perfect mixtures. The meteors are, in other words, imperfect substances, in an intermediary state between pure elements and complete stable bodies that can be defined by their own substantial form. This ontological distinction between perfect and imperfect mixtures is a late medieval elaboration on the doctrine of Aristotelian hylomorphic composition, whereby material bodies are formed by matter and various accidental forms, with the addition of one dominating substantial form.²³ As Fromondus explains, heated water or rain are imperfect mixtures that retain the form of elemental water, while frogs that fall from the sky are not meteors, but perfect mixtures, because they have their own substantial form.²⁴

Aristotelian meteorology is thus not a science of sublunary atmospheric events, but a science of a certain type of mixtures. Not everything that arises in the atmosphere is a meteor and not all meteors arise in the atmosphere. This delimitation of meteorology as the science of imperfect mixtures within the body of Aristotelian physics was firmly established by the early seventeenth century, and it endured well into the century.²⁵ Even Leibniz uses this notion to mark his distinction between aggregates and *unum per se* substances.²⁶ Equally important, for late Aristotelianism the ontology of mixtures serves as the basis for the arrangement of the course on physics in the proper order (*ordo doctrinae*): the imperfect mixtures (the meteors proper) are dealt with in the class on the first three books of the *Meteorologica*, while the perfect mixtures (e.g. minerals) are dealt with in the class on the fourth book of the *Meteorologica*; classes on *De anima* and on the rest of the physical books continue with the study of the animated perfect mixtures.²⁷

coniunctio qualitatum peregrinarum cum naturalibus in eorum elemento. [. . .] Sic enim mixtura quatuor graduum caloris cum totidem frigoris, aquam tepidam, imperfecte mixtam facit. Haec mixtio vocatur imperfecta, quia nondum attingit perfectionem temperiei, quae formam substantialem elementi expellat, & absolute mixti introducat.”

²³ On the concept of mixture in Latin Aristotelianism, see Anneliese Maier, “Die Struktur der materiellen Substanz,” in *An der Grenze von Scholastik und Naturphilosophie* (Rome: Ed. Storia e letteratura, 1952), 1–140.

²⁴ *Meteorologicorum libri sex* (1627), 2.

²⁵ Cf. Rudolph Goclenius, *Lexicon philosophicum* (Frankfurt, 1613), 693; E. a Sancto Paolo, *Summa philosophiae quadripartita*, (Cambridge, 1648), 222–24; Charles-François d’Abra de Raconis, *Tertia pars philosophiae seu Physica* (Paris, 1633), 463–64; Étienne Chauvin, *Lexicon philosophicum* (Leeuwarden, 1713), 403b; etc.

²⁶ Leibniz, *New Essays* III, 6, 42.

²⁷ See e.g., the proemium of *Commentarii Collegii Conimbricensis Societatis Iesu, In libros Meteororum Aristotelis Stagiritae* (Lyon, 1608, with over 100 editions).

The corpuscular theory of matter from *Discourse I* of Descartes's *Meteors* replaced the articles on the doctrine of mixtures that would start an Aristotelian treatise. Descartes's meteors are no longer defined by their ontological specificity as imperfect substances; they are bodies no different than other bodies. As such, *Discourse I* is undermining the very definition of the field, as it was understood in the School. In this sense, it is remarkable that, although Descartes started his investigation with the optical meteors in 1629, in the published essay he kept their place at the end of the treatise, just like the rival manuals do. However, in the scholastic manuals, the optical or "emphatic" meteors are treated last because they are not real meteors, but only appearances—while Descartes discarded this distinction. Descartes's tactics is to mimic the familiar structure of contemporary books, while changing the content.²⁸

Descartes's rejection of the Aristotelian theory of perfect and imperfect mixtures entails his denial of hylomorphism as a description of material bodies. This would have been transparent enough for an attentive reader. But the non-use of real qualities had also more specific scientific consequences. Fromondus's comments on the *Meteors*, to which I now turn, show with more precision how deep the divide was between the Cartesian meteors and the Aristotelian meteors.

A Salty Taste

When Fromondus was asked to give his opinion on the *Essays* of 1637, he replied with a general critique and a number of detailed objections on *The Discourse*, on *The Dioptrics* and on *The Meteors*.²⁹ The brief exchange between Descartes and him, carried out through Fromondus's former student, Fortunatus Plempius, circulated in learned circles.³⁰ As Daniel Garber has shown, Fromondus saw Descartes as one of the Anti-Aristotelians against which he had been arguing throughout his career.³¹ With a generally polite tone, but not devoid of irony, he accused Descartes of falling, without realizing it, into the physics of Epicurus, and he sent him a treatise against

²⁸ Cf. Ofer Gal, "Tropes and Topics in Scientific Discourse: Galileo's *De Motu*," *Science in Context* 7 (1994): 25–52.

²⁹ AT I 402–409.

³⁰ See the comments of Charles Adam in AT XII 241.

³¹ Daniel Garber, "Descartes, The Aristotelians, and The Revolution That Did Not Happen In 1637." See also Geneviève Rodis-Lewis, "L'accueil fait aux *Météores*," and the annotations of Michel Blay and Frédéric de Buzon in Descartes, *Œuvres complètes*, 3: 684–701.

atomism that he had written.³² He compared Descartes to fool Ixion holding a cloud in his arms instead of Juno.³³ Although Baillet claims “a close friendship” between him and Descartes, probably misled by Descartes’s own statements,³⁴ Fromondus’s anti-Cartesianism developed over the years. In 1654 he participated in an anti-Cartesian campaign led by Plempius, and wrote a letter against the Cartesians of his university.³⁵

One of the many technical points discussed in the exchange is the account of the formation of sea salt—a traditional topic taken from Aristotle’s *Meteorologica* II, 3. Unexpectedly for the reader, Descartes introduces in his account on sea salt a digression on sensible qualities, which is a *De anima* topic that one would not normally find in a meteorology book. Descartes provides an analysis of a quality, salty taste, in corpuscular terms (sharp shaped particles are kept by the interstitial subtle matter in perpendicular position while entering the pores of the tongue, and thus provoke the specific taste).³⁶ Fromondus objects that Descartes’s account cancels the qualitative distinction between salt and seawater, reducing it to a mere difference between sharper and smoother particles. Fromondus, who was familiar with atomism, was sensible to these types of arguments that explain the qualities of bodies through a supposed invisible material structure. He provides a classical argument against material atomism, the regress argument against cohesion: the little hooks through which Descartes explains the cohesion of bodies would have to be in turn explained by smaller hooks, and so on.³⁷ Fromondus singles out this account as a symptom of Descartes’s entire approach and he qualifies Descartes’s theory of matter as “nimis crassa et mechanica”; not using real qualities made physics unintelligible for him (“aut nihil intelligo”):

What a paradox, again, when he states at p. 162 that the same corpuscles produce the sensation of cold when they strike gently the tactile sense, and the sensation of heat, when they strike it harder! As if there would be really that much of a difference in

³² *Labyrinthus sive de Compositione Continui* (Antwerp: Balthasar Moreti, 1631). See Geert Vanpaemel, “Libert Froidmont et l’atomisme,” in *Libert Froidmont et les résistances aux révolutions scientifiques*, 131–43.

³³ AT I 402.

³⁴ See AT I 475 and AT II 48–49.

³⁵ The letter is published as an appendix to Plempius, *Fundamenta medicinae* (Leuven: Zegers, 1654).

³⁶ AT VI 250.

³⁷ AT I 406.

that local impulse, and not in the qualities themselves that affect the tactile organ in different ways.³⁸

And he insists:

At pp. 174 and 189 he says that seawater appears salty because the thicker particles of water fall into the pores of the tongue with their sharp end rather than with an oblique fall. As if it would have a different taste, if by chance the particles would push into the organ of taste with their horizontal end! He hopes to explain too many things only through position [*situs*], or local motion, things that cannot be explained without other real qualities—or I do not understand anything.³⁹

At the explanatory level, Fromondus's and Descartes's parallel accounts of various meteorological phenomena may seem similar or interchangeable, as it has been argued.⁴⁰ Both authors appeal to qualities or properties of pieces of matter to explain the behavior of bodies. In Fromondus's case, the explanation of a certain behavior stops at the level of the quality. In Descartes's case, the explanation goes further down to explain the quality through a material composition or another (either particles of a certain type or an elementary mixture of a certain type). While it may be that the actual explanatory accounts of the natural effects change little, the concept of quality changes in a radical way, and this is what Fromondus is protesting against. For Descartes, the quality of salt is not a *real* quality because it can be fully reduced to the arrangement and configuration of particles. It is just a name that we give to that particular material configuration. For Fromondus, although salty taste is also the result of a certain material configuration, it is not explainable through that alone: the taste is the result of the "quality itself" ("in qualitibus ipsis," he writes). For him, the quality is ontologically real because it produces an effect into the world.

³⁸ AT I 407: "Quam etiam paradoxum quod pag. 162 ait, eadem corpuscula, si languide impellant sensum tactus, gignere frigoris sensationem, et caloris, si fortius impellant! Quasi vero tantum differentiæ sit in illo impulsu locali, non in qualitibus ipsis diversimode afficientibus organum tactus!"

³⁹ AT I 408: "Pag. 175 et 189 docet aquam maris apparere salsam, quia partes aquæ crassiores punctim potius quam transversim incidunt in poros linguæ. Quasi alio sapore tincta appareat, si casu transversim partes illæ organo gustus incumbant! Nimis multa sperat se expediturum per solum situm, aut motum localem, quæ sine realibus qualitibus aliis non possunt, aut nihil intelligo."

⁴⁰ Martin, *Renaissance Meteorology*, 136: "many of Descartes' explanations are nearly interchangeable with Aristotelian ones."

Fromondus emphasized this critique a number of times in his letter. Although *The Meteors* is silent about the reality of qualities so as “not to break the peace with the philosophers,”⁴¹ in the correspondence from those years Descartes develops quite explicitly his view on real qualities.⁴² When reflecting back on *The Meteors* later in his career, Descartes himself takes the example of salt to be paradigmatic for his approach to natural philosophy. In the comments he made in 1642 on Regius’s defense against Voetius, Descartes refers back to his treatment of salt in *The Meteors* as an example of how to avoid forms, by submitting them to “mathematical reasoning.”⁴³

One can certainly oppose a doctrine by ignoring it and propose a parallel one, in the hope that the superiority of the proposal will speak for itself. This appears to have been the project of *The Meteors*: to present an alternative mechanical meteorology shaped in a recognizable form that, while not overtly opposing the real qualities, would render the notion redundant. But in order to discern how it is that Descartes arrived at rejecting real qualities in the first place, it will be useful to look for arguments against the reality of accidents in the texts prior to *The Meteors*. In these texts, Descartes developed a better argument for his position than the simple dismissal from *The Meteors*. This, in turn, will allow us also to better assess the post-*Meditations* discussion on real accidents.

II. DESCARTES’S NOMINALISM

It was probably during his second stay in Holland, in 1628–29, when the correspondence mentions a treatise on metaphysics, that Descartes thought more thoroughly about the ontological principles of his physics.⁴⁴ In October 1629, when he decided to explain “all of the meteors,” Descartes also said that he had now also “decided” on “the foundations of philosophy.”⁴⁵ This is the first record of this achievement. *The World* and *The Meteors* appear as fruits of a project of “explaining all the phenomena of nature” according to the new foundations.⁴⁶ The next spring, in May 1630, in one

⁴¹ AT VI 239.

⁴² See letter to Reneri for Pollot, April or May 1638, AT II 43–44, or a letter to Mersenne, 13 July 1638, AT II 223, on weight. Cf. Andreas Hütemann, “Descartes’ Kritik an den realen Qualitäten: das Beispiel der Schwere,” in *Archiv für Geschichte der Philosophie* 83 (2000): 24–44.

⁴³ AT III 506.

⁴⁴ AT I 144.

⁴⁵ AT I 25.

⁴⁶ AT I 70.

of the important letters on the eternal truths (a key doctrine of the “foundations”), Descartes declared that he would explain clearly and definitively the soul of beasts “and the other forms and qualities.”⁴⁷

The unpublished *World*, a project connected with that of the *Meteors*, is much more vocal about the rejection of real accidents than the published essay. The text starts with arguing for the rejection of entities like forms, qualities, or motion as “different things” in material bodies:

Others may, if they wish, imagine the form of fire, the quality of heat, and the process of burning to be completely different things in the wood. For my part, I am afraid of mistakenly supposing there is anything more in the wood than what I see must necessarily be in it, and so I am content to limit my conception to the motion of its parts.⁴⁸

The World will develop this polemical theme throughout the treatise. Discussing motion, Descartes reduces the three levels of the reality of accidents expressed in the School by the notions of *modes*, *modes with foundations in things* and *real qualities* to one category (*modes*). He even translates into French the scholastic terms:

The motion which I posit follows the same laws of nature as do generally all the dispositions and qualities found in matter—including those which the Schoolmen call *modos et entia rationis cum fundamentum in re* (“conceptual modes and entities found in things”), as well as those they call *qualitates reales* (their “real qualities,” in which I confess frankly that I can find no more reality than in others).⁴⁹

He also points out the consequence of this ontological reduction on scientific practice: since all modes can be explained further through motion and the configuration of particles, one could, in the end, even skip the level of qualities altogether in the explanation of natural effects:

If you find it strange that in explaining these elements I do not use the qualities called “heat,” “cold,” “moisture,” and “dryness”—as the philosophers do—I shall say to you that these qualities

⁴⁷ AT I 154.

⁴⁸ CSM I 83 (AT XI 7).

⁴⁹ CSM I 94 (AT XI 40).

themselves seem to me to need explanation. Indeed, unless I am mistaken, not only these four qualities, but others as well, including even the forms of inanimate bodies, can be explained without the need to suppose anything in their matter other than the motion, size, shape, and arrangement of parts.⁵⁰

This kind of direct attack on scholastic notions will be heavily censored in the published *Meteors*. The only direct reference to the scholastic view is a statement at the end of the essay:

Know also that, in order to keep my peace with the philosophers, I have no desire to deny that which they imagine to be in bodies in addition to what I have given, such as their *substantial forms*, their *real qualities* and the like; but it seems to me that my explanations ought to be approved all the more because I shall make them depend on fewer things.⁵¹

However, not using real qualities amounts in itself to a rejection of the notion.

Although Descartes never offers a complete demonstration against real accidents, we can reconstruct *two* arguments on the basis of two basic Cartesian claims: (I) the reduction of the material substance to extension, the configuration of particles and their motion and (II) the thesis of the real distinction of the two substances. I believe that a distinction between these two claims is necessary for understanding Descartes's thinking about real qualities. Argument I can stand without argument II and vice versa. One can be committed to a non-hylomorphic description of bodies (an atomist) without necessarily making any claim about the spiritual substance, or about its separation from matter. Conversely, one can be a dualist and subscribe to a hylomorphic description of material bodies.

Étienne Gilson and Daniel Garber have both insisted on the argument from the thesis of the real distinction of substances (II), which features prominently in the *Meditations* and the *Replies*. According to this argument, the scholastics introduce in physics entities that are thought of on the model of "little souls joined with their bodies," by importing a concept from the thinking substance into the material substance.⁵² Real accidents,

⁵⁰ CSM I 89 (AT XI 25–26).

⁵¹ Olscamp 268 (AT VI 239).

⁵² AT III 648. Gilson, "La critique cartésienne des formes substantielles," in *Études*, 143–68, Daniel Garber, *Descartes's Metaphysical Physics*, chapter 4 and "Formes et qualités

forms and qualities, are a product of the confusion between thought and extension, a pre-critical prejudice of our childhood from a time when “our mind was so immersed in the body that it knew nothing distinctly.”⁵³ Consequently, Descartes is taken to offer a critique of material hylomorphism only after he has completed the metaphysical deduction of the real distinction between the two substances in the *Meditations*. Gilson thought that the Aristotelian notion of nature was formed on the model of the idea of the soul and that Descartes understood and critiqued this conception through the thesis of the real distinction of substances. Garber has proposed that argument (II) by itself is not successful, because it leaves out the possibility of hylomorphic composition in man. I argue in what follows that Descartes’s critique of real accidents proceeds instead from a mechanical reduction of real accidents to modes of extension (argument I). While argument II (real distinction) is difficult to find in the corpus prior to the *Meditations* and the *Replies VI*,⁵⁴ argument I (nominalist reduction of accidents to extension as simple modes, on the basis of mechanical principles) offers the advantage of being a basic tenet of Descartes’s scientific project from its earliest manifestations.

Replies VI

Argument II (real distinction) is developed extensively in *Replies VI*, where Descartes narrates a personal history on how he has arrived at the real distinction between body and soul. However, it is precisely in this text that Descartes also introduces argument I (reduction of accidents to modes of extension) as *a necessary step* in the very establishment of the real distinction between substances. The chain of reasons proceeds in the following steps (I summarize AT VII 440–41):⁵⁵

dans les Sixièmes Réponses,” in *Descartes: Objecter et répondre*, ed. Jean Marie Beyssade and Jean-Luc Marion (Paris: Presses Universitaires de France, 1994), 449–69; cf. Michel Fichant’s comments on Garber in the same title, 471–72.

⁵³ *Principia philosophiae*, I, 47, AT VIII 22 and esp. I, 71, AT VIII 35; see also AT IV 114 (letter to Mesland, 2 May 1644): “Pour la difficulté d’apprendre les sciences, qui est en nous, et celle de nous représenter clairement les idées qui nous sont naturellement connues, elle vient des faux préjugés de notre enfance, et des autres causes de nos erreurs, que j’ai tâché d’expliquer assez au long en l’e’crit que j’ai sous la presse.”

⁵⁴ Cf. Fichant, *Descartes: Objecter et répondre*, 478; and Ferdinand Alquié in *Descartes, Œuvres philosophiques* (Paris: Bordas, 1963–73), 2: 882, note.

⁵⁵ Cf. Garber, “Formes et qualités dans les Sixièmes Réponses” for an alternative reconstruction.

- (1) The *Meditations* have established the real distinction between body and soul; Descartes was therefore compelled to assent to this metaphysical truth⁵⁶;
- (2) However, he was not “entirely persuaded” by it⁵⁷;
- (3) Nevertheless, he continued to use the foundational principles established by the *Meditations* in his physics (“rerum Physicarum”). The consideration of physical things implies an examination of the ideas and notions of things: one needs to submit the notions of things to proper distinctions so that they can be put in agreement with judgment⁵⁸;
- (4) Through exercise (3), Descartes was brought to know that there is nothing in body but extension, motion, and figure⁵⁹;
- (5) The same exercise (3) brought him the knowledge that the sensible qualities of colors, smells, taste, and the like do not have any existence outside of thought⁶⁰;
- (6) The same exercise (3) brought him the knowledge that weight, solidity, the power of heating, attracting, purging, and all other qualities can be reduced to motion or the privation of motion, and to the configuration of particles⁶¹;
- (7) Going back and considering why it is that he initially thought differently about these matters, Descartes realized that his false

⁵⁶ AT VII 440 1–6: “Cum primum ex rationibus in his Meditationibus expositis mentem humanam realiter a corpore distingui, et notioem esse quam corpus, et reliqua collegissem, cogebam quidem ad assensionem, quia nihil in ipsis non cohaerens, atque ex evidentiis principiiis juxta Logicae regulas conclusum, advertentem.”

⁵⁷ AT VII 440 6–11: “Sed fateor me non idcirco fuisse plane persuasum, idemque fere contigisse quod Astronomis, qui, postquam Solem esse aliquoties Terra majorem rationibus eviderunt, non possunt tamen a se impetrare, dum in illum oculos convertunt, ut judicent non esse minorem.”

⁵⁸ AT 440 11–17: “Postquam autem ulterius perrexi, et iisdem innixus fundamentis ad rerum Physicarum considerationem transivi, primo attendendo ad ideas, sive notiones, quas de unaquaque re apud me inveniebam, et unas ab aliis diligenter distinguendo, ut judicia omnia mea cum ipsis consentirent [. . .]”

⁵⁹ AT VII 440 17–21: “[. . .] adverti nihil plane ad rationem corporis pertinere, nisi tantum quod sit res longa, lata et profunda, variarum figurarum, variorumque motuum capax; ejusque figuras ac motus esse tantum modos, qui per nullam potentiam sine ipso possunt existere [. . .]”

⁶⁰ AT VII 440 21–25: “[. . .] colores vero, odores, sapes, et talia, esse tantum sensus quosdam in cogitatione mea existentes, nec minus a corporibus differentes, quam dolor differt a figura et motu teli dolorem incutientis.”

⁶¹ AT VII 440 25–29: “[. . .] ac denique gravitatem, duritiem, vires calefaciendi, attrahendi, purgandi, aliasque omnes qualitates, quas in corporibus experimur, in solo motu motusve privatione, partiumque configuratione ac situ consistere.”

judgments were caused by his ignorance of the distinction between extension and thought. This ignorance caused him to attribute intellectual things to corporeal things and vice versa.

This is the most elaborate argument against real accidents that Descartes ever gives. It proposes a tight reasoning that combines arguments (I) and (II) mentioned above. The account starts and ends in the real distinction of substances, thus justifying the support it offers to argument (II), while steps (3) to (6) develop the critique of real accidents on the basis that the various accidents of material bodies can be reduced to motion and the configuration of particles, i.e. argument (I). In this text, Descartes claims that the metaphysical deduction of the real distinction of substances, by itself, *is not enough*: in step (2), Descartes is not entirely convinced. It is only after step (3), after a consideration of the notions of extension and thought as applied in physics (i.e. as applied to material bodies as they exist in the world, as opposed to the abstract notion of body) that Descartes is persuaded of the real distinction between substances, and it is only in step (7) that the real distinction between substances can offer a full critique of real accidents. In other words, without the critical consideration of the notion of extension from step (3), Descartes would not have been fully persuaded by the real distinction of substances—just like an astronomer, he says, who still judges that the Sun is smaller than the Earth when he has it in front of his eyes, even though he knows through reason that it should be much bigger. Descartes needed the *a posteriori* demonstration of physics to fully assent to the metaphysical truth of the real distinction.⁶² The critique of real accidents of the kind that argument (II) proposes, arriving at a “psycho-analysis of Aristotelian physics,”⁶³ is in this text *secondary* to argument (I), the nominalist reduction of material accidents to modes of extension.

We have established that the text from *Replies VI* uses argument (I) in order to arrive at the critique from argument (II). In a text from *Rule XIV* Descartes has developed more extensively steps (3) to (6), the consideration of the notions of things and the reduction of body to extension, in a more elaborated form.

⁶² Cf. the nuanced analysis of Michel Fichant, “La ‘fable du monde’ et la signification métaphysique de la science cartésienne,” in *Science et métaphysique dans Descartes et Leibniz* (Paris: Presses Universitaires de France, 1998), 59–84.

⁶³ Gilson, *Études*, 168: “une psychologie de la physique aristotélicienne.”

Rule XIV

The relationship of the Rules with the publication of 1637 is complex and hard to grasp because of our lack of means for dating with precision the text and the stages of its elaboration.⁶⁴ Nevertheless, this is of little concern for the present analysis. I take the argument from *Rule XIV* to be reflected in the text from the *Replies VI* analyzed earlier and thus to be a part of a sustained meditation on the critique of the reality of accidents. The argument may have evolved by the time that the *Replies VI* were written, but Descartes's anti-Aristotelianism never changed.

Rule XIV is part of the "mathematical" part of the treatise (covering *Rules XIII–XXIV*, left unfinished), meant to treat perfectly conceived notions. In *Rule XIII*, Descartes abstracts the body from its material specificity, so that it can be "geometrized" by reducing extension to figures. Abstraction is an operation of the intellect alone; as such, it cannot be used when considering physical matters. Therefore in the next rule, *Rule XIV*, Descartes appeals to the imagination as a faculty that allows us to assign a corporeal nature to the abstracted body, and thus make it physical. Imagination is the only faculty that can grasp a corporeal (extended) nature, because it is itself corporeal.

In this cognitive context, *Rule XIV* proposes a digression on an ontological question much discussed in the Schools: is there a reality of extension as distinct from body?⁶⁵ This question is introduced as an illustration for the proper use of imagination. To solve the issue, Descartes appeals to a test: if one can imagine extension without the body, then extension will be really distinct from body. Since this cannot be done, there will be no real distinction between extension and body. Those that think that extension can exist by itself without the body are not using a corporeal idea (their imagination), but a bad judgment (their intellect). It is a matter of using the right faculty for the right purpose:

Of course the learned often employ distinctions so subtle that they disperse the natural light, and they detect obscurities even in matters which are perfectly clear to peasants. So we must point out to such people that by the term "extension" we do not mean here something distinct and separate from the subject itself, and that we generally do not recognize philosophical entities of the sort that

⁶⁴ Cf., however, Garber, "Descartes and Experiment in the *Discourse and Essays*."

⁶⁵ The digression starts at AT X 442.

are not genuinely imaginable. For although someone may convince himself that it is not self-contradictory for extension per se to exist all on its own even if everything extended in the universe were annihilated, he would not be employing a corporeal idea in conceiving this, but merely an incorrect judgment of the intellect alone.⁶⁶

Descartes continues the text with a complete critique of scholastic real accidents. Stating that he doesn't take extension as something separated from its subject ("hic per extensionem non distinctum quid et ab ipso subjecto separatum designari"), he rejects all of the *entia philosophica* used by the philosophers ("neque in universum nos agnoscere ejusmodi entia philosophica, quae revera sub imaginationem non cadunt.") The imperfection of the intellect (*intellectus male judicans*) supposes philosophical entities where there are none: real distinctions cannot be inferred on the basis of intellectual abstraction alone. Conscious of stepping into a field well-discussed in the schools, Descartes brings to the discussion the entire scholastic apparatus of the theory of distinctions to support his argument, in a technical analysis of common language (*extensio occupat locum = extensum occupat locum; corpus habet extensionem = extensio non est corpus*).⁶⁷ This analysis establishes that there can be no real distinction between the accident of extension and body, as most of the scholastics held, with the exception of the *nominales*. This digression from *Rule XIV* could stand very well in a scholastic disputation.

It is also remarkable that Descartes reverts completely to an Aristotelian-Thomist view of accidents in this text, as ontologically dependent on their subject. He quotes (perhaps unconsciously) Aristotle's definition of accidents as "being in a subject" and being "conceived" only together with a subject.⁶⁸ Later on, this cognitive argument, based on the proper use of the faculties of the soul, will become one of the most prominent features of Descartes's critique of hylomorphism. As Descartes

⁶⁶ CSM I 59 (AT X 442).

⁶⁷ See the analysis of Jean Marie Beyssade, "'L'e'tendue n'est pas le corps' (*Regulae XIV*, AT X, 444, L. 18). Genres d'être et façons de parler dans les *Regulae*," *Laval the'ologique et philosophique* 53 (1997): 755–66, repr. in *Descartes au fil de l'ordre* (Paris: Presses Universitaires de France, 2001), 88–104. On Descartes's theory of distinctions, see the letter from 1645–46 at AT IV 348–350. On the importance of the late medieval theory of distinctions for early modern philosophy, see André de Muralt, *L'enjeu de la philosophie médiévale* (Leiden: Brill, 1993), 47–89.

⁶⁸ AT 444, 5–9, a direct quote from *Categories* 2, 1a 23–25. Cf. the comments of Jean-Luc Marion in his translation of Descartes, *Règles utiles et claires pour la direction de l'esprit en la recherche de la vérité* (The Hague: Nijhoff, 1977), 264ff.

explains to Regius in January 1642, substantial forms are just substances (souls), because they can be “conceived” as stand-alone *res*; on the contrary, material forms cannot be “conceived” as stand-alone *res*.⁶⁹

The text from *The World* quoted earlier develops further this idea of a *test* for determining real distinctions in physical things. *The World* starts with a critique of the representational power of language in a chapter on “the difference between our sensations and the things that produce them.” Someone may imagine a form of fire, a quality of heat and an action of burning to be “completely different things in the wood.” But one can add or remove these entities without any effect for the process of burning; on the contrary, adding or removing the motion of the particles will actually decide whether the wood will burn or not:

For you may posit “fire” and “heat” in the wood, and make it burn as much as you please: but if you do not suppose in addition that some of its parts move apart and detach themselves from their neighbors, I cannot imagine it undergoing any alteration or change. On the other hand, if you take away the “fire,” take away the “heat,” and keep the wood from “burning”; then, provided only that you grant me there is some power which puts its finer parts into violent motion and separates them from the coarser parts, I consider that this power alone will be able to bring about all the same changes that we observe in the wood when it burns.⁷⁰

If the quality can explain an effect, it will be posited; if not, there is no reason to “conceive” it. Descartes also reiterates here his idea that the reason behind positing a non-existent quality is a prejudice: it is a transmission of our sensation (heat) in the body in front of us. Argued for in this way, it will be clear that the thesis of the real distinction of substances (argument II) will help dispel that prejudice. *But this is not the argumentative move that Descartes presents first.* Here, the reasoning that concludes with the non-relevance of qualities starts from the consideration of natural effects and goes through a process of trial and error, subtracting and adding explananda: motion explains things, qualities do not. *After* the trial and error decides that it isn’t the quality of heat or that of fire that produces the effect (alone), the critique of the prejudice through the distinction of substances can be set into place.

⁶⁹ AT III 502.

⁷⁰ CSM I 83 (AT XI 7).

CONCLUSIONS

Texts prior to 1641, and especially the suppressed *World*, show that Descartes was engaged in a critique of real accidents very early, a commitment that he will downplay heavily when publishing the *Meteors*. But the *Meteors* themselves show this engagement in action, as an *a posteriori* proof of an unpublished principle. *Rule XIV* offers an elaborated argument against real accidents in nominalist terms. The argument from *Replies VI* also incorporates the line of thought started in *Rule XIV* as a necessary step in the establishment of the real distinction of substances.

The doctrinal development of real accidents has a rich history, reaching a turning point with Descartes. Late Aristotelian ontology, contrary to some seventeenth century misrepresentations, is not a prolific pile of entities; on the contrary, it is quite careful in assigning the status of *res* to accidents.⁷¹ Aristotelian textbooks of the early seventeenth century may present debates over what constitutes a real quality and what doesn't, but their complete rejection is unheard of. Meteorology itself is entirely based on the appeal to the four elemental qualities, the hot, the cold, the wet and the dry, understood as real qualities, and the scholastic course of physics is divided based on this notion. At the same time, authors that opposed Aristotelianism were willing to discard them. Isaac Beeckman, Descartes's early collaborator, held the view that hot and cold are explainable in terms of motion as early as 1617.⁷² The superfluity of substantial forms was publicly denounced in one of the theses proposed by Antoine de Villon and Etienne de Clave at the University of Paris in 1624, which stirred quite a scandal.⁷³ When looking at Descartes's numerous statements on real accidents in this context, one finds that from the beginning of his career he had been campaigning against them, more or less timidly, depending on audience.

The reduction of real accidents to modes, in itself, is not a new position in the metaphysics of substance. Descartes was radicalizing a tendency

⁷¹ Cf. Pasnau, *Metaphysical themes*, 197–98.

⁷² *Journal tenu par Isaac Beeckman de 1604 à 1634*, ed. Cornelis de Waard (La Haye: Martinus Nijhoff, 1939), 1: 132.

⁷³ See the documentation published by Didier Kahn, "La condamnation des thèses d'Antoine de Villon et Etienne de Clave contre Aristote, Paracelse et les 'cabalistes' (1624)," *Revue d'histoire des sciences* 55 (2002): 143–98, second article in the text of the placard. On the early rejection of quality realism, see Pasnau, *Metaphysical themes*, 179–99. For the immediate context of Descartes, see Garber, "Descartes, The Aristotelians, and The Revolution That Did Not Happen In 1637"; Roger Ariew, *Descartes Among the Scholastics* (Leiden: Brill, 2011); and Roger Ariew, "Descartes, Basson et la scolastique renaissante," in *Descartes et la Renaissance: Actes du colloque international de Tours des 22–24 mars 1996*, ed. Emmanuel Faye (Paris: Honoré Champion, 1999), 295–309.

internal to Latin Aristotelianism. Descartes's anti-realism argues against the Scotist view of a univocal understanding of the "being" of accidents and substances.⁷⁴ Under a certain pressure from the nominalist current, a tendency in late Aristotelianism was to transfer those real qualities that are explainable by material configurations alone to the status of modes. Ockham's test for the reality of accidents had spared the elemental qualities as the last *entia philosophica* over and above extension.⁷⁵ Historically, the kind of hylomorphic austerity that would lead to the reduction of the Aristotelian primary qualities, including the elemental ones, to modes, had not gone beyond Ockham. It doesn't appear the early Renaissance atomists had a sustained mediation on nominalism. If anything, with the spread of Scotism and the rejection of the *nominales*, seventeenth century ontological thinking was inclined more towards quality realism than ever before. Aristotelian meteorology, for instance, as defined by the distinction between imperfect and perfect mixtures, could not survive without it.

Descartes's small essay on *The Meteors* of 1637 shows thus an engagement in a bigger battle. Although he censured himself heavily with respect to the reality of accidents in *The Meteors* (as *The World* shows), Descartes had the conceptual means to mount a frontal attack against it. He chose not to, and he hoped that the subversive implications of his physics would go unnoticed. In spite of the apparent innocence of the book, Schoolmen such as Fromondus saw in *The Meteors* a menace for their physics. When Fromondus received the Cartesian *Essays* in 1637, Descartes's explanations may not have seemed that revolutionary to him. There were other figures determined to ridicule the science of the Schools at the time and Fromondus knew them well. The inventiveness of Descartes's scientific narratives could not make up, in his eyes, for their fundamental heterodoxy. It is because of his rejection of real qualities that Fromondus accuses Descartes of atomism. It was not a light accusation; Dante had reserved a special place for people like him in the sixth circle of the inferno.

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⁷⁴ For the passage from analogy to univocity of being in a historical perspective, see Étienne Gilson, *Jean Duns Scot: Introduction à ses positions fondamentales* (Paris: Vrin, 1953); and Olivier Boulnois, *Être et représentation: Une généalogie de la métaphysique moderne à l'époque de Duns Scot (XIII^e–XIV^e siècle)* (Paris: Presses Universitaires de France, 1999), esp. 223–65. For Descartes and Scotism, see Roland Dalbiez's seminal critique of Gilson: "Les sources scolastiques de la théorie cartésienne de l'être objectif (à propos du Descartes de M. Gilson)," *Revue d'Histoire de la Philosophie* 3 (1929): 464–72; and Ariew, "Descartes and the Scotists" in *Descartes among the Scholastics*, 71–100.

⁷⁵ *Summa logicae*, I, 55: "For something is not made hot or cold through this alone and that the thing and its parts are moved locally. Hence all such qualities imply *res* distinct from the substance," quoted and translated by Pasnau, *Metaphysical themes*, 403.