THE UNIVERSITY OF CHICAGO

THE BEGINNING OF THE END OF MATTER:

THREE MOMENTS IN THE HISTORY OF AN IDEA, 1547-1713

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Abstract

The notion of matter had been invariably used in philosophical discussions from the High Middle Ages down to early modern times. In this long history of its usage, however, one cannot fail to notice a rather radical semantic shift. What was originally the relational notion of the Peripatetic *ὕλη*, or Thomist *materialitas*, which was reserved for the proximate substrate of enmattered phenomena [*λόγοι ἔνυλοί*], gave way to the absolute notion for the totality of the world as external [*res extra me posita*], to the point where questioning the existence of matter became equivalent to a skepticism in regards to the existence of a mind-independent world *tout court*. The following study presents three key moments in this tumultuous historical development of matter, from being a constitutive part of things, to becoming a thing in itself, to be finally reduced to nothing. Accordingly, the arc of this story begins with the popular Renaissance understanding of *ὕλη* rooted as it was in Aquinas and Averroës and expounded by Alessandro Piccolomini (Chapters I-II); it then segues into the Cartesian matter posited besides the thinking substance (Chapter III); and closes with George Berkeley declaring matter an empty and even contradictory notion (Chapter IV). This developmental story suggests that each thinker, in deciding which aspects of experience he was going to be realist about, was inevitably influenced by the specific theoepistemic values he was operating within. It will become clear that each iteration in this gradual vanishing of matter was embedded in larger œconomies of ideas, axioms, and intuitions each of which came with their proper metaphysical anthropology; the boundaries drawn between mind and matter, self and world; and, ultimately, the degree to which material things could be known at all. Aquinas felt compelled for conceptual as well as doctrinal reasons to make the human mind rely on an external material world for both its world-directed and reflexive functions. Though always turned to (*convertendo ad*) the world of particulars as the proper and immediate object of the *intellectus*, however, the postlapsarian man could never know a subsistent thing by its essence, including his own self, at least not in *vita præsentia*. But when we reach Descartes, we find him thinking in terms of the new values emerging in his day: the historical urgency for a rational demonstration of the immortality of the soul; new perceived ways divine benevolence can be cashed out; and the ambient epistemic optimism about finding certainty in nature. Descartes will raise the thinking self to a first principle of knowledge, and the like level of intuitive certainty afforded introspectively he will raise it to a first principle of being: conceivability becoming the true mark of existence, actual or potential. To make this *cogito* metaphysically possible, however, Descartes had to reconfigure the traditional distinctions between mind-thought, self-world. So the reader of the *Meditationes* (1641) is asked to relinquish a mindset that had taken the existence of the external world as intuitively evident, but left the immortality of the soul be settled by revelation, and enter another where the self could identify itself with its immortal cogitative part but which leaves the existence of anything outside of it uncertain or inconclusive. Consequently, the existence of matter that was admitted as an indemonstrable postulate in premodern times (Ch. I-II), would stand as a demonstrable theorem in the modern (Ch. III.IV). Ultimately, this seemed to have set off a process of *dematerialization* or *spiritualization* of the world that would not be completed until all ideas had been purged of their material counterpart in the real world, culminating in the first modern immaterialist (or absolute idealist) view

arrived at independently by George Berkeley (1710, 1713) and Arthur Collier (1713). In his time, Berkeley (Chapter IV) found that original notion of a material *substratum* to have receded further away from our grasp, towards the vanishing point of any possible characterization. Confronted with such featurelessness, Berkeley urges the doctrine of matter be dropped entirely in the name of an all inclusive mode of existence in two *voces*: thinking and being thought, *percipere* et *percipi*.

To my son Ira, who kept on reminding me this is neither the beginning nor the end.

... τοὺς γὰρ ἀνθρώπους φησὶν
Ἀλκμαίων διὰ τοῦτο ἀπόλλυσθαι,
ὅτι οὐ δύνανται τὴν ἀρχὴν
τῷ τέλει προσάψαι.

… the reason people perish
is that they are unable to bind
the beginning to the end.
—pseudo-Aristotle, *Problēmata*, XVII, 916a.

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Abbreviations

ST	*Summa Theologiæ*. Vols 4-7 *Opera Omnia*. Rome: Commissio Leonina, 1888-1892.
SCG	*Summa Contra Gentiles sive De Veritate Catholicæ Fidei contra errores Infidelium*. Vols. 13-15 *Opera Omnia*. Rome: Commissio Leonina, 1926.
QdV	*Quæstiones disputatæ de veritate*. Vols. 22, 1-3 *Opera Omnia*. Rome: Commissio Leonina, 1888-1892.
QdA	*Quæstiones disputatæ de anima*. Vols. 24, 1 *Opera Omnia*. Rome: Commissio Leonina, 1888-1892.
De Ent.	*De Ente et Essentia.* Rome: Aedes Universitatis Oregorianae, 1970.
In Met.	*In Duodecim Libros Metaphysicorum Aristotelis Expositio*. Rome: Marietti, 1950.
AT	*Œuvres de Descartes*. 11 vols. Paris: J. Vrin, 1964-1974.
CSM	*The Philosophical Writings of Descartes*. 3 vols. Cambridge; New York: Cambridge University Press, 1984.
SEH	*The Works of Francis Bacon*. 7 vols. London: Longmans, 1857-1874.
OFB	*The Oxford Francis Bacon*. 15 vols. Oxford: Clarendon Press, 1985-2012.

Image List

•figures by author unless otherwise indicated.

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I am indebted to Lorraine Daston for all her rigorous help in crafting this story with me—per structure, style, and theme—for her intellectual generosity, and indefatigable support through the whole process. It was Lorraine who allowed me eventually to see the "weak light shining through the forests of the particulars" and, by the letter of Francis Bacon, (which marks the first metaphorical use of Kepler's discovery in anatomical optics) to remove myself from reality no farther than so the rays of truth can converge at the same point.[1] I can only hope I may prove to be as valuable to a future student of mine as she has been to this student of hers. She was the reason I chose this doctorate program as she is also the reason I am graduating it.[2]

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[1] "Intellectum longiùs à Rebus non abſtrahimus, quàm vt rerum imagines, & radij (vt in ſenſu fit) coire poſſint; undè fit, ut Ingenij uiribus excellentiæ non multum relinquatur" [*Distribvtio operis* in Francisci de Verulamio, *Instauratio Magna* (London; Joannis Billium, 1620), p. 9].

[2] On a side note, I want to also thank all the staff maintaining and doorkeeping the lobby of Windermere property in Hyde Park, Chicago, whose names I do not know, but who kindly allowed an non-resident spend countless hours working on a dissertation during the unhappy days of 2020-2021, when all other public spaces were shut down.

PREFACE: EITHER DUCK OR RABBIT

> The history of the doctrine of matter has yet to be written. … The entity has been separated from the factor which is the terminus of sense-awareness. It has become the substratum for that factor, and the factor has been degraded into an attribute of the entity. In this way a distinction has been imported into nature which is in truth no distinction at all. … In this way matter has emerged as being the metaphysical substratum of its properties, and the course of nature is interpreted as the history of matter.[3]

In the early seventeenth century, we are taught, a novel worldview was emerging across Europe displacing in the process some deeply entrenched habits of thinking that dated back to the High Middle Ages. Indeed, such were the constancies described as of late, that they could not be squared with what nature had hitherto been perceived to be and do.

In terms of celestial physics, Johannes Kepler reported in print that the time it takes for any one of the six planets to complete a full revolution is proportional to a power of its distance from the sun.[4] But whatever constancy these celestial bodies ought to express in their beautific state, their motions were neither circular—for Kepler found them to be elliptical in 1609—nor effortless —for, Kepler wrote in his 1597 work, they needed to constantly readjust their paths like boats sailing against a steady stream of influence that carried them away, i.e. the *anima*

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[3] Alfred North Whitehead. *The Concept of Nature. Tarner lectures delivered in Trinity College November 1919* (Cambridge, Cambridge University Press, 1920), p. 16.

[4] $T^2 \propto R^3$ where T is a given planet's sidereal period in years and R is the mean distance of the planet from the sun —or the semi-major axis of its orbit—as described for the first time in Johannes Kepler's *Harmonice Mundi*, *Libri V* (Linz, G. Tampachii, 1619).

motrix of the sun.[5]

In regards to terrestrial physics, on the other side of the Alps, Galileo had famously noted the isochronism of pendulum motion as a reluctant student of medicine at Pisa (c. 1583); and by the first decade of the 1600s he had a theory of uniform acceleration and the first inklings to the all-too-critical concept of inertia. But a model of the physical world that relies on everyday practical intuitions as the Peripatetic one does, would suggest then, as it would do today to a mind innocent of the modern principles of physics, that the measure of motion we impart in bodies by pushing or pulling them cannot be maintained without a constant supply of our force. In that view, a body that continues to move in uniform motion when no longer in contact with the agent and in the absence of any medium to prolong the motion by its *antiperispasis*, would verge on the miraculous. It would be perceived no less unlikely than the ever-elusive *perpetuum mobile*, a machine of perpetual motion.

Most importantly however, what really flew in the face of the principles of the prevalent terrestrial physics was that the ratios governing *the motions of free-falling bodies were observed by them regardless of their nature, size, or their assigned stratum* in the Ptolemaic universe of

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[5] In the *Mysterium Cosmographicum* (1596) he held that the eccentric orbits are the net-effect of a spirit exerted from the sun in composition with "… an individual spirit in whichever planet, by whose set of oars [*remigio*] the star ascends in its orbit" (Johannes Kepler, *Gesammelte Werke*, vol. 1 [Munich: C. H. Beck , 1937–], XIX, doc. 5.4, 194; as trans. in James R. Voelkel, *The Composition of Kepler's Astronomia nova* [NJ: Princeton University Press, 2001], p. 139, n33). In a letter from 1605, Kepler wrote that: "Nunc utraque autem suâ animâ retinetur, ne cogantur, ut ego caput in sublimi teneo ui animali, (hoc est grauitate) quod citra eam à Terrae magnete in pauimentum pertraheretur" (*Gesammelte Werke*, XV: 243, ll. 136-9). And later he claimed: "Retinetur igitur Luna ab animâ suâ, ne coeat cum Terra, quamuis intra orbes uirtutum tractricium constituatur" (*Ibid*., 243-4 ll. 151-153. The same notion of *vis animalis* can be found in the *Astronomia Nova* (1609). However, in the second edition of his *Mysterium Cosmographicum* of 1621, some twenty-four years after the first publication, he substitutes *anima motrix* for *vis motrix*: "*Si pro voce anima vocem Vim ſubſtituas, habes ipſiſſimum principium, ex quo Phyſica cœleſtis in Comm. Martis eſt conſtituta et lib. IV Epitomes Aſtr. exculta. Olim enim cauſam moventem Planetas abſolute Animam eſſe credebam, quippe imbutus dogmatibus J. C. Scaligeri, de motricibus intelligentiis. At cum perpenderem, hanc cauſam motricem debilitari cum diſtantia, lumen Solis etiam attenuari cum distantia à Sole: hinc concluſi Vim hanc esse corporeum aliquid, ſi non proprie saltem æquivoce; ſicut lumen dicimus eſſe aliquid corporeum, id eſt, ſpeciem a corpore delapſ[a]m, ſed immateriatam.*" [*Mysterium Cosmographicum*, p. 77, Nota (c) in Cap. XX]. Cf. Sakamoto, Kuni Sakamoto, *Julius Caesar Scaliger, Renaissance Reformer of Aristotelianism*, History of Science and Medicine Library 54 (Leiden; Boston, Brill, 2016), ch. 5.

nested spheres. In *De Caelo* IV.2, 309b, Aristotle had stated clearly that between any two chunks of matter, the one with the higher concentration in earthly nature would descend faster towards the center of the earth, just as, between two flames, the one with the higher concentration in fiery elements would ascend faster towards the heavens. The kinetic behavior of each mixture depended on the predominant element within and the swiftness of its motion was directly proportional to how much of that stuff it contained in the same cumulative way a carriage pulled by ten horses should move ten times as swiftly as it would if only pulled by one. By contrast, the new regularities observed (or often logically adduced) were not tied to any specific kind of mixture, its concentration in a particular element, or the state it naturally strives for. If the Galilean laws of fall pertained to all terrestrial bodies *qua* bodies and the effect did not intensify in proportion to its concentration in that element, what *inner principle of motion and rest*[6] would physics purport to study after all?

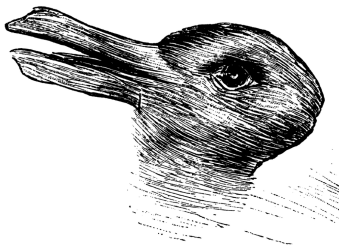

fig. 1 *Fliegende Blätter*, No. 2465 (23 October 1892): 17.

When such displacements in the history of ideas are presented to wider audiences, they are often indexed as breaks, shifts, or revolutions—like the proverbial Copernican one, or the Cartesian and the Newtonian—taking the transition to be no less paroxysmal than the spontaneous perceptual shift of a viewer between the two objects of a *double image*. The same earth

[6] Rendered in Latin as *principium motus et status; impetus mutationis innatus* in *of Aristotle's Physica* II.1, *Moerbeke's* translatio 'noua' Iacobi Venetici translationis recensio, in Thomas Aquinas, *Commentaria in octo libros Physicorum Aristotelis*, *Opera Omnia*, vol. II (Roma: Commissio Leonina, 1884).

presents itself now as an immobile center of the universe, now as another body revolving around the sun, just as the same lines present themselves now as a rabbit, now as a duck (fig. 1). But there is nothing in between rabbit and duck, mobile and immobile earth.[7] However, the history of thought abounds with such in-between states (such as Tycho Brahe's model for example), seeing neither duck, nor rabbit, or perhaps seeing both at the same time (in the context of the Cartesian relativity of motion).[8]

The sheer granularity possible in specialized scholarly research today, combined with an invigorated interest in the micro-facts surrounding the formation of new knowledge, make this era manifest itself as a *continuum* of sorts. Any two given moments within a continuum are attended by intermediate states, unlike the two discreet objects of duck and rabbit.[9] These kinds of continuities would seem to pose problems to the historians of our times analogous to the ones that steered mathematicians of that time towards the invention of integral calculus. A method was wanting then for integrating instantaneous speeds into a continuous accelerated motion, as perhaps a method is wanting now for integrating discrete facts into a historical event. And if the way

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[7] Thomas Kuhn posed multistable figures like that of the duck and the rabbit as a perceptual analogue to the historical mechanism of shifting paradigms: "The subject of a gestalt demonstration knows that his perception has shifted because he can make it shift back and forth repeatedly while he holds the same book or piece of paper in his hands. Aware that nothing in his environment has changed, he directs his attention increasingly not to the figure (duck or rabbit) but to the lines on the paper he is looking at. Ultimately he may even learn to see those lines without seeing either of the figures, and he may then say (what he could not legitimately have said earlier) that it is these lines that he really sees but that he sees them alternately as a duck and as a rabbit" (Thomas Kuhn, *The Structure of Scientific Revolutions* [Chicago: University of Chicago Press, 1970], p. 114). Kuhn references the work of Norwood Russell Hanson as well as "other colleagues" who by then made use of such experiments of shifts in visual Gestalt for history of science (N.R. Hanson, *Patterns of Discovery* [Cambridge: Cambridge University Press, 1958], p. 10-14), four years behind the *Structure* (1962).

[8] As Roger Ariew acknowledges, by negating the reality of the old distinction between space and place in *Principia* II: 10-15, and identifying both with corporeal nature, Descartes makes absolute immobility an impossibility and mobility a matter of perspective (Roger Ariew, *Descartes and the Last Scholastics* [Ithaca: Cornell University Press, 1999, p. 31).

[9] That continuum suggested itself in the work of great historians of science of the 20th c.—such as Pierre Duhem, Étienne Gilson, Alexander Koyré, A. O. Lovejoy, A. C. Crombie, Edward Grant, William A. Wallace, David C. Lindberg, Roger Ariew, Stephen Gaukroger to name a few—who diverted their focus to the conceptual antecedents of modern scientific reason.

the former problem was solved offers any indication of how the latter might be solved, the historian would have to integrate her story out of an infinite number of minute plot-twists.

Such a nuanced story of the era of scientific revolutions would reveal (if not so much as to confirm) that the emerging "paradigm" of modern science, though indeed very different from the preceding one, was often articulated with a rather old stock of terms, handed down as they were from Late-Medieval and Renaissance systems of thought.[10] As a matter of fact, history often saw progress being made even from within those antiquated models of nature. Indeed many applied-Aristotelians' of the Renaissance happened to have produced original work on the basis of

[10] Indeed, it was by keeping true to strict to Aristotelian teleology that Andrea Vesalius corrected Galen's assumptions in (*De humani corporis fabrica*, (Basil: I. Oporini, 1543). See Sarah Parker, "The Limits of Categories in Girolamo Cardano's *De Subtilitate*," in *Anatomy and the Organization of Knowledge, 1500–1850*, eds Brian Muñoz, Matthew Landers (London and NY; Routledge, 2014), 79. So far as the theory of science is involved, even Galileo considered himself an Aristotelian, often portraying his work as a continuation of Aristotle's (if not only for diplomatic reasons): "... I claim that I observe more religiously the Peripatetic or I should rather say Aristotelian teachings than do many who wrongfully out me down as averse from Good Peripatetic philosophy (letter to Liveti, Aug 25, 1640; Stillman Drake, *Galileo at Work: His Scientific Biography* [Chicago: University of Chicago Press, 1978], pp. 407-408)." William Harvey too, as a devout Aristotelian, would quote from Aristotle in his most important book *Exercitatia Anatomica de Motu Cordis et Sanguinis in Animalibus* (Frankfurt: B. Fitzerus, 1628), while he prefaced his book on generation, *Exercitationes de Generatione Animalium* (London: William Dugard, 1651), with a synopsis of Aristotelian empirical methodology. As a matter of fact, the discoverer of the circulatory system himself who functionally reduced the heart to a pump and showed the way for Descartes to describe the whole human body as an hydraulic automaton, remained himself a stout vitalist and rejected mechanist explanations of his day (W.C. Aird, "Discovery of the cardiovascular system: from Galen to William Harvey," *Journal of Thrombosis and Haemostasis*, 9 [2019]: 118-129). What is more, Harvey writes in the same book that blood is the "animal heat, in so far, namely, as it is governed in its actions by the soul" as it also is celestial "as subservient to heaven," in *The Works of William Harvey* (London: Sydenham Society, 1857), 508. Walter Pagel has stated that: "[T]here is Harvey's genuine adherence and loyalty to Aristotle in which he maintained remarkable consistency. ... [S]oul is not something incorporeal-a 'spirit'-that is added to a body, but it is the body itself to the extent that it functions, is alive and accomplishes the purposes inherent in its plan. Form and function constitute and idea of 'spirit' that is 'given' with the body and inseparable from it. ¶ It was precisely this that Harvey predicated of the blood in preference to the heart. In this, then, he was more Aristotelian than Aristotle himself, for he followed the latter's vitalist lead to its logical conclusion. ... [H]eart and blood form a functional unit. ... This view of the blood as active working-matter with inherent spiritual impetus indeed follows from Harvey's intransigent vitalism. His point of view is informed by the Aristotelian concept of the *Connate Pneuma* and thus remains essentially Aristotelian even where he seems to diverge from the Master" (Walter Pagel, *William Harvey's Biological Ideas: Selected Aspects and Historical Background* [Basel; New-York: S. Karger, 1967], pp. 332-3).

a very unoriginal set of Peripatetic premises.[11]

Consider Girolamo Fracastoro, who used a *regressus* argument and the Aristotelian rejection of *actio in distans*, Girolamo Fracastoro to arrive at a proto-microorganismic theory of disease (*De contagione*, 1546); or Jean Fernel, who acknowledged the limitations of Galenic medicine by making the whole substantial form the epicenter of disease (*De abditis rerum causis*, 1548); or, finally, Andrea Cæsalpino, who used strictly Aristotelian theories of the soul and principles of taxonomy to advance a new system of plant classification, possibly the first one since antiquity.

Alternatively, there were new models of explanation being applied to the pre-established phenomena. Indeed, we often see the cutting-edge corpuscularian hypotheses being invoked for saveing the articles of accumulated superstition or mysteries of faith. Francis Bacon for example

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[11] Beginning sixteenth century, we could materially consult the intuitions of any one of the following philosophers: Alessandro Piccolomini of Sienna, an Aristotelian-minded astronomer and natural philosopher of the Thomist-Averroist bend who frequented Padua in 1538-1542 in the aftermath of the great debates between Averroists and Alexandrists; Girolamo Fracastoro, famed physician, a University of Padua graduate and appointed professor at the age of 19 (!); Andrea Cæsalpino, the innovative zoologist associated with the University of Pisa, and second director of its botanical garden; Jean Fernel, another physician, educated and later made professor in the University of Paris. Three major works of these writers were in fact published in consequent years: Fracastoro's *De Contagione* (Venice, 1546), Piccolomini's *De Certitudine* (Rome, 1547), and Fernel's *De Abditis* (Paris, 1548) [the *De Plantis Libri XV* arriving much later (Venice, 1571); (Florence, 1583)]. Together they offer a good sample of Renaissance Aristotelianism as applied in at least three concrete fields of natural philosophy, medicine, physiology (a term coined by Fernel himself as early as *De naturali parte medicinæ* præfatio [Paris, 1542]; before it appeared as a title in *Physiologia* [1567]), zoology, and epidemiology. The diverse background of philosophers such as Piccolomini and Fernel is testament to the broad reach and wide purview that Aristotelian discourse was stretched over in the Renaissance. All four men—from Padua, Verona, Paris and Pisa respectively—happened to have produced original work on the basis of a very unoriginal set of Peripatetic premises: Fracastoro used a *regressus* argument and the Aristotelian rejection of *actio in distans* for the deduction of a microscopic *substratum* responsible for contagion across the seas [*seminaria contagionum*]; hitting upon a proto-microorganismic theory of contagious disease in place of the miasmatic theories of the past (Girolamo Fracastoro, *De contagione et contagiosis morbis et curatione libri III* [Venice, apud heredes Lucacantonij Iuantæ Florentini, 1546]). Jean Fernel, among other things, acknowledged the limitations of the classical understanding of sickness as a humoric disposition (distemperment) by making the whole substantial form the epicenter of disease (*De Abditis Rerum Causis libri II* [Paris: apud Chrestien Wechel,1548]). Finally, by using strictly Peripatetic principles of historization and classification of botanic traits, Andrea Cæsalpino succeeded in advancing a new system of plant classification, possibly the first one since Theophrastus, on the basis of the organs of reproduction and fructification—the instruments for the two powers of the vegetative soul, growth and reproduction—as opposed to classifying plants through the noxious or beneficial effects in the traditional *materia medica*. As a professor at Pisa, Cæsalpino also confirmed his teacher Colombo's description of pulmonary circulation. Lorraine Daston finds this an interesting idea but thinks physicians especially had already been confronted with a great deal of novely in terms of new diseases (plague, french pox) and *materia medica* (plant species from the new world).

explained natural magic as a causal, material connection between minds in analogy to miasmic contagion among bodies;[12] while Kennelm Digby offered a corpuscular explanation for the weapon salve[13] or the *hoplocrisma* of ancient tales, which described a treatment based on the sympathetic connection established between a weapon and the wound it had inflicted. While Robert Boyle explained away many of these seeming sympathies with the model of the 'key and the lock,' he also reported certain qualities in existence that are due to "some unheeded relations and impressions which those bodies owe to the determinate fabrick of the grand system or world they are part of."[14] What is more, both Descartes and Leibniz (but not Malebranche) offered their own explanations for the Romish doctrine of transubstantiation in promotion of their own ex-

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[12] Francis Bacon, *Sylva Sylvarum, or a Naturall Historie in Ten Centuries* (London: John Haviland, 1626 [1627] X: §197-200.

[13] In the first half of 17th century, 1617-25, many thinkers were embroiled in a debate regarding the possibility of sympathetic relations between the wound and the weapon that caused it. There were treatises like that of Kennelm Digby that attempted a corpuscular explanation of the assumed phenomenon, and others like that of the Protestant minister William Foster who used Aristotelian natural philosophy for arguing about its impossibility, in an attempt to protect the Protestant name that he believed was in jeopardy as soon as Rudolph Goclenius raised the issue. Cf. Francis Bacon's *Sylva Sylvarum*, X: §911.

[14] Robert Boyle, *Tracts about the Cosmicall Qualities of Things, Cosmicall Suspitions*, *… to which is praefixt an introduction to the history of particular qualities* (Oxford: W.H., 1671) later included by Peter Shaw, the editor of the *Philosophical Works* (London, W. Innys and R. Manby, 1725) I: §IX, p. 283, in an enlarged version of *The Origine of Formes and Qualities* (1666) [as it also was by Thomas Birch, ed. *The Works of the honourable Robert Boyle*, 5 vols. (London: A. Millar, 1744)]. The following quote comes from the latin edition of the same work published in 1680: "[S]i prioribus ſuis orbis hujus locis reſtituerentur, novum acquiſitura ſint fundamentum Facultatum vel Potentiarum & Diſpoſitionum, quæ quoniam dependent ex inobſervatis relationibus & impreſſionibus, quas corpora iſta debent determinatæ Fabricæ magni Syſtematis mundani, commodum credidi, ſi, uſque dum commoditas fortè ſe offerat, Coſmicarum vel Syſtematicarum Qualitatum nomine appellarem. … Præcipuè in hoc Diſcurſu conſidero impreſſiones, quas corpus recipere poteſt, vel potentiam quam acquirere poteſt ab iſtis vulgo incognitis vel ſaltem inobſervatis agentibus, quibus ita, non ſolùm pro modo peculiaris texturæ vel Diſpoſitionis, ſed & virtute generalis Fabricæ mundamæ afficitur" (*De Systematicis vel Cosmicis Rervm Qvalitatibvs*, in *Introdvctio ad historiam qvalitatvm particvlarivm cui subnectuntur tractatus de cosmicis rerum qualitatibus*, ... [Geneva: Samuelis De Tournes, 1680], cap. I , p. 2). Cf. John Henry "Boyle and Cosmical Qualities," in *Robert Boyle Reconsidered*, edited by Michael Hunter (Cambridge: Cambridge University Press, 1994); Frederick J. O'Toole, "Qualities and powers in the corpuscular philosophy of Robert Boyle," *Journal of the History of Philosophy* 12 (1974): 295-315.

planatory principles.[15] What is more, some particularly sensitive applications of the outdated doctrine of substantial forms, especially as it concerns the human soul, were left unchallenged.[16]

All these instances suggest that, just as there was no shortage of cases where new principles were invoked to save the noumenal truths of faith, there were also cases where pre-modern ways of thinking were used to pick out and make sense of new features of the natural world, if only as tenors for scientific analogies for the dynamical behavior of celestial objects [the *vis* in analogy to the *anima*], or the contagious nature of a disease [*seminaria* as the bearers of disease] etc.[17]

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[15] What is more, dissent was often expressed and evaluated in the same terms that consent did, only negatively so. William Gilbert, who famously hypothesized the earth is a giant magnet with the north and south points acting as its poles (William Gilbert, *De Magnete, Magneticisque Corporibus, et de Magno Magnete Tellure* [London: Peter Short, 1600], disapproved of Aristotelians for separating the earth from the order of a universe governed by punctiform intelligences and prime movers. The alternative to that view however was to ascribe Aristotelian souls to all coordinated bodies, i.e. a rearrangement of how old notions extended over the visible universe. In cases, on the other hand, where independent intellectuals would distance themselves from the Aristotle of the universities—the so-called *novatores* such as A. Patrizi, T. Campanella, G. Bruno—they did so by embracing far more interesting, but equally unmodern views and unscientific in their own manner (B. Telesio relying on Democritean-Epicurean intuitions). They would seek an alternative to the academicized Aristotle in the Plato, Plotinus and Proclus of the humanists and resort to a vitalist cosmos governed by the *anima mundi*, driven by occult influences, correspondences of the macrocosm into the microcosm, and sympathies that act in a distance. Take the illustrious Johannes Kepler for example. Kepler was the kind of genius that could formulate the first principles of a celestial physics within a Copernican universe and at the same time (as also in the same book, *Harmonice Mundi* [Linz: Godofredo Tampachii, 1619] be convinced planet earth is an ensouled body [*anima telluris*] by which it instinctively perceived astrological positions (i.e. the Ptolemean *aspectus* in W. Moerbeke's translation of *ἐπιθεώρησις*); that it was thus instigated like some immense yet undifferentiated animal into modifying its climate, its water levels and inducing volcanic and seismic activity.

[16] In the overall project of eliminating substantial forms from their supposed explanatory station, Robert Boyle was careful to note in the preface that: "[W]hen ever I shall speake indefinitely of Substantiall forms, I would alwayes be understood to except the Reasonable Soule, that is said to inform the human Body" (Robert Boyle, *The Origine Of Formes And Qualities* [Oxford: H. Hall, 1666], preface). And there are times where Descartes talks about the relation between body and soul as "substantial unity." Writing to Arnauld for example against the charge he sets forth a Platonic conception of human beings that: "… in eâdem ſextâ Meditatione, in quâ egi de diſtinctione mentis a corpore, ſimul etiam probavi ſubstantialiter illi eſſe unitam (AT VII: 227-8; CSM II: 160). Also, see the letter to Mesland written in 1645 (or 1646) stating: "… l'vnité numerique du corps d'vn homme ne depend pas de ſa matiere, mais de ſa forme qui eſt l'ame" (AT IV: 346 CSM III: 278-9).

[17] It might be more fruitful to think in terms Jean Piaget used in the 1920s to approach child cognitive development and apply them tentatively, *mutatis mutandis*, to describe analogous processes in intellectual history at large: Assimilation, Accomodation, Equilibrium. Cf. J. Piaget, *The Development of Thought*: *Equilibration of Cognitive Structures* (Viking Press, 1977). By way of illustration, a toddler confronted with a dolphin will most likely assimilate it under his notion of the fish-kind. Later he will perhaps learn that habitat (earth, water, air) does not quite "cut nature at its joints," so he would have to revise his taxonomy accordingly, and like Aristotle make a new class based on the mode of reproduction, under viviparous animals. Cf. Aldemaro Romero, "When Whales Became Mammals: The Scientific Journey of Cetaceans From Fish to Mammals in the History of Science" in *New Approaches to the Study of Marine Mammals*, eds. Aldemaro Romero and Edward Keith. (London: IntechOpen, 2012).

To be sure, René Descartes was no Fracastoro, or Cæsalpino. He explicitly declared his impatience with antiquated notions such as the *prima materia*, *species intentionales*, *formæ substantiales*, *accidentia realia*, and most crucially, he rejected the Aristotelian universal framing of change (*motus*, or *κίνησις*) as *ens in potentia qua in potentia est* (*Physica*, III.1) as a hopeless attempt at explaining the evident through the obscure, *obscurum per obscurius*. And yet, as commonly required of innovators in intellectual history, Descartes would need a way to explain the unknown through the known, or the unfamiliar through the familiar, both in the process of discovery and as an expository tactic.

Consider Robert Boyle, for example, who took the old scholastic distinction between *qualitates primæ*—the hot, cold, dry, and moist—and *qualitates secundæ*—such as lightness, softness etc. that are emergent upon the former—and recasted it in corpuscularian terms,[18] making them stand on either side of the corporeal-mental divide. Or, the fact that he takes a group of dispositional properties of matter, as a *Convention of Accidents*, to be "*sufficient to perform the offices that are neceſſarily requir'd in what Men call a Forme"* (*Origine*, 66-67). In other words, Boyle acknowledges the explanatory and classificatory needs that substantial forms were supposed to fulfill, before commanding an alternative way of satisfying them.

Similarly, Descartes managed to do was to renovate the philosophical discourse of his time by taking a kernel of concepts that had been developed by the philosophers and theologians of the High Middle Ages—in their struggle of making sense of *their* world and man's place with-

[18] *The Origine*, Preface [iii], VI, p. 43. "Far from proceeding to expel color and other scholastic real qualities from the domain of natural philosophy, Boyle labors to make room for them in the external world, allowing them to count as qualities, albeit secondary ones, treating them as powers, and developing a rigorous account of their identity as defined in relation to their environment. It is Boyle, in fact, who first appropriates the common scholastic distinction between primary and secondary qualities and recasts it in its now familiar mechanistic shape, with secondary qualities understood as powers or dispositions in objects" (Pasnau, *After Certainty*, 67). Cf. Jean Fernel*, On the Hidden Causes of Things*, Lib II, Cap. 1 [64] 407 & Lib II, Ch. 9, [92-93] 530-1.

in—only to make them refer to a different world all-together. After all, Descartes *had to use a familiar enough technical terminology to be understood by his readers, yet use it in ways original enough so as to point them to an entirely different world*. Using Étienne Gilson's expression, sometimes there is indeed "new wine being poured into old bottles."[19]

What is unique in Descartes is that the transition from the old world to the new is dramatized as a personal transformation: his own person in the autobiographical *Discours de la méthode* (1637) and the persona of the meditator in his *Meditationes de prima philosophia* (1641). By choosing to emulate either Descartes's own intellectual coming-of-age in a span of nine years after the proverbial epiphany in Ulm, 1619, or the meditative journey from first to last meditation, the reader is supposed to partake in the experience of discovering, for one's self, the first principles of being and of knowledge. What Descartes offered, we may claim, was a dramatized version of what became known in the early modern times as analysis—called *via resolutiva* in the Renaissance, as opposed to the *via compositiva* that was associated with the formally dogmatic teaching methods of the time. In addition, such a methodical analysis was supposed to make up for the lack of transparency Descartes noted in the ancients, whom he took to have concealed their methods of discovery in fear it would diminish their achievements.[20] As a mark of

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[19] "Nous n'oublions pas l'art qu'eut toujours Descartes de verser du vin nouveau dans de vielles outres…" quoting E. Boutroux in Étienne Gilson, *Etudes sur le Rôle de la Pensée Médiévale dans la Formation du Système Cartésien*, (Paris: Vrin, 1951), p. 247.

[20] "I have come to think that these writers themselves [i.e. Pappus and Diophantus], with a kind of pernicious cunning, later suppressed this mathematics [as hints of a *mathesis universalis*] as, notoriously, many inventors are known to have done where their own discoveries were concerned. They may have feared that their method, just because it was so easy and simple, would be depreciated if it were divulged; so the gain our admiration" (*Regula* IV, in *Œuvres de Descartes*, ed Charles Adam and Paul Tannery (Paris: J. Vrin, 1908) X: 376-377; *The Philosophical Writings of Descartes*, trans. J. Cottingham, R. Stoothoff, and D. Murdoch (Cambridge; New York: Cambridge University Press, 1984) I: 19." And this passage from the *Discours*, part 6 which can as well be read as the manifesto of the modern era: "... I believed that I could not keep them [i.e. general notions concerning physics] secret, without sinning gravely against the law which obliges us to procure, to the best of our ability, the general good of all men" (AT VI: 61; CSM I: 142).

intellectual generosity then, Descartes was supposed *to let the reader into the process of discovery.* And as part of a new kind of rhetorics in the age of scientific revolution then, *these radical shifts in the ways of thinking were presented* as *a shift between states taken on by the selfsame subject*.[21] In terms of the optical analogy used earlier, it would be the equivalent of the same observer being guided through a perceptual shift from seeing the duck to seeing the rabbit. What would the reading experience be of such a leap? Could we historicize the *Meditationes* not only for the principles it puts forward, but as a carefully crafted reading experience for transforming a mindset in the model of the spiritual exercises of St. Ignatius and the spirit of St. Augustine?[22]

In such an experience the reader of the *Meditationes* would witness a set of familiar terms in the philosophical trade, *corpus*, *materia*, *anima*, *mens*, *species*, being suspended from their traditional referents—plucked out, as it were, from their wider *œconomies of meaning*—as s/he arrived into a new state of conceptual equilibrium that had been prepared for him/her. We know from Descartes's pen that this was part of a strategy for familiarizing the reader to his principles and, as related to Marin Mersenne, to "recognize the truth in them before they notice that they

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[21] Frances Gray noted about the common expression 'Descartes's meditator' in the literature that: "[t]heir use of the third person seems to invoke the Ignatian spiritual director/meditator dyad that would cast Descartes in the role of the spiritual director. … Yet from Descartes' first-person description of the meditational process, we might conclude that he is the meditator. In this scenario, we might conceive of him as someone who is meditating and then carefully recording what is happening to himself with the result that he progresses to the same place as the third-person meditator. There is no spiritual director (except perhaps for divine inspiration), and Descartes is going it alone, as it were" (Frances Gray, *Cartesian Philosophy and the Flesh: Reflections on incarnation in analytical psychology* [London; New York, Routledge, 2012], p. 39).

[22] See for example Gary Hatfield "Descartes's Meditations as Cognitive Exercises" Philosophy and Literature 9, No 1 (April 1985), pp. 41-58; Bradley Rubidge "Descartes's Meditations and Devotional Meditations," *Journal of the History of Ideas* 51, No. 1 (Jan.-Mar., 1990), pp. 27-49; Frances Gray, Chapter 2, in *Cartesian Philosophy and the Flesh: Reflections on Incarnation in Analytical Psychology*, "Spiritual exercises and Descartes' Meditations" (London; New York, Routledge, 2012), pp. 30-51. It is well known that La Flèche, Descartes's *alma mater* included a thirty-day spiritual retreat, cf. Walter John Stohrer, "Descartes and Ignatius Loyola: La Flèche and Manresa Revisited: *Journal of the History of Philosophy* 17 no. 1 (1979): p. 11-27; Stephen Gaukroger, *Descartes: An Intellectual Biography* (Oxford: Clarendon Press, 1997).

destroy those of Aristotle."[23] In this study in particular, it will be claimed that Descartes guided his readers to see themselves as epistemic Adams and Eves, claiming back capacities for self-reflexion and pure thought that were barred from in the preceding metaphysical anthropology. What if we are more Adam and Eve than we thought we were? What if that exalted form of intuitive knowledge of the self and intellectual nature is possible *vita præsentia*, and the corporeal world may be known through *species* or *natures* that are connatural to our minds?

A more granular approach of historical progress then would have to acknowledge such subtle forms of progress in discourse that predate the antagonizing of the conceptual establishment by a full-fledged theory, providing perhaps that elusive middle object in the switch between the duck and the rabbit; something that is *neither* duck *nor* rabbit, or *both* duck *and* rabbit. Such an imperceptible form of progress would focus on *how the same old concepts begin to make reference to different things or aspects* of the world, before they get reclaimed by, absorbed into, or entirely annulled by a new discourse. Think for example Aristotle's neologism *ἐνέργεια* for a completed or fully-determined state of matter that nineteenth-century physicist oddly coupled with its complete negation, *δύναμις*, to frame the notion of *potential energy*. Alternatively, the same objects already delimited within an established nomenclature can be referenced by a new one. Think for example the ancient species of 'quadruped, viviparous animals' being substituted by 'vertebrate placental mammals' in modern taxonomies.

This might be especially pertinent to the history of metaphysics due to the purported scope of its principles. The basic framework of being *qua* being would seem to last longer than what each era qualifies as a unit of being. Think of that perennial concept of *οὐσία*, or *substantia*

[23] In a letter from 1641, he tells to Marin Mersenne he expects the readers to "gradually accustom themselves to my principles and recognize the truth in them before they notice that they destroy those of Aristotle (AT III: 297-298)."

for example, keeping in mind that, although its denotation can be assumed to have remained relatively fixed way into to the early modern era, it got to extend over very different items—from human embodied souls to angelic minds, and from the Ego, to the monad, to God or the physical universe as a whole.[24] Depending on how strictly they are applied, metaphysical categories may refer to different physical aspects of the world, while based on how indeterminate they are, they can be determined into different, often contesting, theories of matter, action, motion etc. This I take was the spirit of the comment made by Antoine Arnauld and Pierre Nicole about the shortcomings of Aristotle's *Physica*, in their second edition of their *La logique ou l' art de penser*. It is not that the Aristotelian doctrine of nature is false, they tell us, but, on the contrary, that "it is too true and teaches us only things of which we cannot be ignorant."[25] For, "Who can doubt that everything is composed of matter and a certain form of this matter?" In other words, without taking a further stance on what these terms mean and the particular features of the world they are

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[24] We are reminded of Montgomery Furth's poignant remark about Aristotelian metaphysics in *Substance, Form, and Psyche: An Aristotelean Metaphysics* (New York: Cambridge University Press, 1988) that, though we are presented with a determinate metaphysical framework of forms and matter, substances and qualities, actions and passions, actualities and potentialities etc. what qualifies as a substance was not meant to be determined by metaphysical speculation alone. That is, to use the example of Theseus' ship (originally reported by Plutarch, reiterated and added upon with Thomas Hobbes adding the latest twist), the point at which we admit the formation of a new ship out of the parts of the original, or the dissolution of the latter in the process, is entirely left to what we may call the metaphysician's *taste in substantial wholes*. The study of the *ens qua ens* offers an explanation for (or a way of talking about) substantial change, i.e. for the generation and degeneration of substances, only upon the presupposition of a threshold in the ever-heaping pile of planks above which it qualifies as a ship (and below which it does not). Now, since for the biologically-minded Aristotle what qualifies as a substance in the primary sense is the concrete living being, it all comes down to determining the point of entry of an organism into the order of being, as well its exit therefrom. In other words, the peripatetic metaphysics is expected to primarily feature such beings that are said to live and die. So, it is entirely left to the metaphysician's intuitions and preoccupations to acknowledge the units of being that are relevant to her special object of metaphysics.

[25] "[I]ts main defect is not that it is false, but, on the contrary, that it is too true and teaches us only things of which we cannot be ignorant. Who can doubt that everything is composed of matter and a certain form of this matter? Who can doubt that to acquire a new manner and form, it must not have had it previously, that is, it must have had its privation? [*Car qui peut douter que toutes choses ne soient composées de matière et d'une certaine forme de cette matière? Qui peut douter qu'afin que la matière acquière une nouvelle manière et une nouvelle forme, il faut qu'elle ne l'eût pas auparavant , c'est-à-dire qu'elle en eût la privation? Qui peut douter enfin de ces autres principes métaphysiques, que tout dépend de la forme; que la matière seule ne fait rien; qu'il y a un lieu, des mouvements, des qualités, des facultés? Mais après qu'on a appris toutes ces choses, il ne semble pas qu'on ait appris rien de nouveau, ni qu'on soit plus en état de rendre raison d'aucun des effets de la nature*]" (Antoine Arnauld and Pierre Nicole, *La Logique ou l'Art de Penser* [Paris: Charles Savreux, 1664], p. 35). As translated in *Logic or the Art of Thinking*, ed. Jill V. Buroker (Cambridge: UK; New York: Cambridge University Press, 1996), p. 19-20.

supposed to pick out, they are too ambiguous to spell out any meaningful philosophical position.

We may also look at it through the theatre analogy. If the principles of metaphysics are to how they are interpreted in each case, as a theatrical play is to this or that rendition, *the vicissitudes of metaphysics in the history of thought would not so much look like the succession of different plays performed in the same stage*—say *Macbeth* or *Hamlet* performed in the Globe theater—*but rather the same play being cast with different actors*—say Laurence Olivier and Vivien Leigh's *Macbeth* of 1955, or Ian McKellen and Judi Dench's from 1976. The play itself does not change in the same way or the same frequency it is cast and performed anew.

INTRODUCTION: FROM PART, TO THING, TO NOTHING

> For we muſt know that the *genius* of [Aristotle's] Philosophy led him to fancy an ὑποκείμενόν τι, *a certain ſubject or obediential power* in every thing that fell within the compaſs of Phyſical ſpeculation, or that had any relation to any natural body.[26]

Matter (or *ὕλη* or *materia* and *matiére*), being the subject of this study, is another term of philosophical art invariably featured in the 'theater of metaphysics' from High Medieval to early modern times. One notes however that, over that period, *what used to be a original relational notion of* ὕλη *reserved for the proximate substrate of enmattered phenomena* [*λόγοι ἔνυλοί*][27] *gave way to the absolute notion for the totality of the world as external,* [*res extra me posita*][28] before it was ultimately reduced to a featureless *substratum* [*a nec quid, nec quantum, nec quale*].[29] To trace, in short, *the historical understanding of matter from part, to thing, to nothing.* Drawing on the same simile, these three moments in intellectual history are meant to show that, just as a character in the "play" of metaphysics can be cast anew, it may as well be rewritten or even entirely omitted. In that sense, the first immaterialist philosophers believed the play could be performed even if the role of a *substratum* was left uncast.

In his day, Bishop Berkeley found the material world to have been whittled out of its ob-

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[26] John Smith, "Of the Immortality of the Soul" *Select Difcourfes*, edited John Worthington (London: Printed by J. Flesher, 1660), 111.

[27] *De Anima* I.1, 403a 25.

[28] *Meditatio* III, V, VI, in *Œuvres de Descartes*, ed Charles Adam and Paul Tannery (Paris: J. Vrin, 1908) VII: 37-40 *passim*; 63-64, 77.

[29] *Commonplace Book* in *The Works of George Berkeley,* ed. A. C. Fraser, vol. I (Oxford: Clarendon Press, 1901) p. 59.

vious qualitative features down to some vague mode of existence no less continuously and gradually than Descartes's wax was reduced, over a series of transformations, to a vague statement of identity, no signs remaining of that original thing it is supposed to be identical with. But just as the whole illustration relies heavily on those broad identity conditions of a piece of wax under transformation,—who would deny, after all, this is the same wax?[30]—Berkeley relies on a very broad framing of 'matter' under this gradual vanishing.

To trace the development of its meaning, as much as to plot out the course of its perceived vanishing, Berkeley relies on a *substratum* of *common notions that conjunctively suggest something extrinsic to the self and beyond its control*. 'Matter' in this picture is what lies behind the screen of our perceptions on the basis of two principles: (a) all qualities need to inhere in a subject, whose contrapositive made one of Descartes's *æternæ veritates* [*nihili nulla sint attributa*];[31] (b) when a thinker is subjected to a quality without or even against their consent, they cannot be the total cause of that quality. These two principles working together, along with the evidence of sense suggest a very vague realism that seems almost native to human thought; a realism in regards to at least *some* world besides the self [*extra me posita*] or besides the soul [*res extra animam*] lest we be obliged to admit the possibility we might have always dwelled in, and never awakened from, a collective dream.

However, just as Descartes's illustration would not work if what qualified as a piece of wax in the beginning was found to be different in the end, Berkeley's timeline would not work either, if the premodern matter had in fact not qualified in the same way modern matter is. Despite how convenient such conceptual continuity would be historiographically speaking—as well

[30] "Remanetne adhuc eadem cera? Remanere fatendum est; nemo negat, nemo aliter putat" (*Med.* II, AT VII: 30).

[31] *Principia* I: XI, AT VIII: 25 ll 7-8; also I: LII.

as the rhetorical power available to the immaterialist for making their views side with the course of a historical process—the theory of matter preceding the Cartesian achievement, seems to be part of a separate and self-contained œconomy of concepts rooted in the discourses that had emerged in the High Middle Ages. This study aims at tracing the transformations of matter in philosophical meaning, reference, and connotation, with the prospect of illuminating the particular historical and conceptual milieu that legitimized each iteration.

Indeed, many themes introduced by Descartes had already been countenanced or briefly considered within the scholastic tradition, but were pushed back for the purpose of preserving the established equilibrium. In fact, it will be shown that the ability to problematize the existence of the world itself and reconstitute it by a new criterion of certainty relies on a completely different theoepistemic framework. There is, for example: (a) a different manner that God expressed His benevolence across the worlds of Thomas, Descartes, and Berkeley; (b) different theological anthropologies that determined the boundaries between world and self, and those between matter and thought. Finally, there was (c) a general surge of epistemic optimism: the idea that we can indeed be absolute knowers of the relations and order we ourselves project onto the world, instead of shortcomers of the divine understanding of the world.

Of these three trajectories of trasformation (c) may of course admit of degrees and be historically instantiated across various authors from both the Protestant and the Reformed Church's side as Peter Harrison had presented quite definitively.[32] The other two trajectories (a), (b) seem to suggest an abrupt change between two discrete value-systems, much like the perceptual shift between duck and rabbit. Still, I wish to show that Descartes in fact occupies a rather sophisticat-

[32] Peter Harrison, *The Fall of Man and the Foundations of Science* (Cambridge: Cambridge University Press, 2007).

ed intermediate position between the pre-modern duck and the post-Cartesian rabbit using elements of the old discourse to bring a new world into relief (i.e. the doctrine of ideas, the idea of intuitive perception, the nomenclature of thought contents, a universal and unificatory form knowledge beyond any given subject matter) or, alternatively, pick up the *same traditional objects or points-of-view* though framed from within a different conceptual ecosystem (human intellect, angelic intelligence).

In adumbrating the passage of matter from part, to thing, to nothing, it might be helpful to provide the following parallel vectors of change: (.1) of matter as something contained underneath, to something existing outside, to something existing nowhere; (.2) of things composite once said *sicut simitas* into things abstract said *sicut eclipsis*; (.3) from *a part of the thing*, to *a thing in itself*; (.4) from matter determining grades of perfection and of certainty in an Aristotelian-Thomist context; to an all-or-nothing affair between matter and thought, finally to the view that finds matter internally incoherent. Finally, we witness a transformation from (.5) matter, the adobe of the particular, to that which lies outside consciousness; to a featureless *substratum* in Berkeley's analysis. These adjustments in discourse may be perceived as subplots to the overarching story:

	From	***To***
.1	something existing *underneath*	existing *outside*
.2	omnia sicut *simum*	omnia sicut *eclipsis*
.3	*constitutive of particular* things	a *particular thing in itself*
.4	admitting of *degrees*	an all-or-nothing affair
.5	the abode of the Particular	the unconscious, unperceiving realm

.1 From Underneath to Outside

Some of the very first metaphors or neologisms in what would develop into a theory of matter were prefixed by *ὑπο-,* such as the Platonic *ὑποδοχή,*[33] the Aristotelian *ὑποκείμενον*,[34] and the Stoic and Neoplatonic *ὑπόστασις*.[35] Following similar spatial analogies about 'something lying below,' or 'underneath,' the Latin language derived its equivalent terms by semantic loans. The *ὑποκείμενον* was regularly glossed as *subiectum* in Latin (from *subiacere*: to lie underneath) or *substratum* (from *substernere*: to stretch beneath, its literal sense corresponding to the post-classical Greek *ὑπο+στορνύω-μι*, *στρώννυω-μι*, *στορέννυω-μι*). Similarly, the literal origins of *ὑπόστασις* [*substantia*] pointed to something a structure could be founded upon or a liquid compound be reduced to. The Greeks used the term to refer to the foundation of a temple, or a formation of clouds [*νέφους ὑποστάσεις*].[36] But it also signified the sediment that settles in the bottom as in grape-pressing or of various bodily processes in the Hippocratic and Galenic *corpus*.[37] How humble the origins of a term that would be later invoked by the Neoplatonists to signify the triadic principles of the universe, or by the Nicene Christian fathers to distinguish person

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[33] *Timæus* 50b-51c, in *Platonis Opera*, IV.

[34] Main *loci* on persisting and non-persisting *substrata* include: *Phys*. I.7, *De Gen. et Corr.* I.4, *Met.* Gamma 24, *Met.* Eta 5, *Met*. Theta 7. The *Organon* brings out its grammatical or syntactical sense as the subject-term in a predication facilitating the distinction between the accidental and the substantial categories. As such, it applies both to essential relations and inherence relations in verbal form (*ὑποκεῖσθαι*). The non-logical books however bring out its more strictly physical-metaphysical sense as a *terminus* of change, substantial or accidental, be it what survives the change (Socrates-getting-tanned) or a stage that is necessarily transgressed on the path to some development (caterpillar-becoming-butterfly).

[35] So we have the Stoic Posidonius distinguishing reality from phenomenon as the *καθ' ὑπόστασιν* as opposed to the *κατ' ἐπίφασιν*. The Stoic and Neoplatonic *ὑπόστασις* appears in post-Nicean patristic literature about the doctrine of the trinity. In the thirteenth century, Aquinas uses *hypostasis* as synonymous with *persona* and only for particular substances that have the complete nature of a species [*completam naturam speciei*] (*ST* Ia Q75.A4, ad 2).

[36] Diodorus Siculus's *Bibliotheca Historica*, Loeb Classical Library 279, trans. C. H. Oldfather (Cambridge MA: Harvard University Press, 1933). I: 38, p. 134.

[37] Henry George Liddell, Robert Scott, and Henry Stuart Jones, eds. *A Greek-English Lexicon* (Oxford: Oxford University Press, 1961).

[*πρόσωπο*] from nature [*φύσις*] in expounding the doctrine of the Trinity!

Now Aristotle chose to invoke the notion of the indeterminate stuff in his philosophy, by broadening the meaning of the word 'timber,' effectively turning *ὕλη* ever since into a term of philosophical trade, glossed as *silva* in Latin by a semantic loan.[38] He meant to make reference to something that stands to form as timber stands to the keen hands of a woodworker; someone who would see in it—where perhaps we can no longer see—a boundless potential for forms carved, structures erected, and functions served (fig. 2).

[38] We find Francis Bacon for example referencing Cicero's use of silva (woodland) and supellex (furnishings) as metaphors for "ſtuffe and varietie" (*Tvvo Bookes*, II, p. 5r: *silva rerum*, *ac sententiarum* in Cicero, *De Oratore* III.26.103; or, as we may add, the *silva medicinæ* in Pliny; "Verecundus erit usus oratoriæ quasi supellectilis. Supellex est enim quodam modo nostra quæ est in ornamentis alia rerum alia verborum" (*Orator* 24.80). In Bacon's own *Sylva Sylvarum* (1626-7) *sylva* conveys the meaning of a store of particulars, or a database of experiments. In the second half of the seventeenth century, for example, William Petty was reported to have prepared a "Supellex Philosophica" for the Dublin Philosophical Society, containing a list of "40 instruments requisite to carry on the designs of this society" (*Minutes of the Philosophical Society of Dublin*. British Museum Ad. Papers, 4811 [Dec. 1st 1684]).

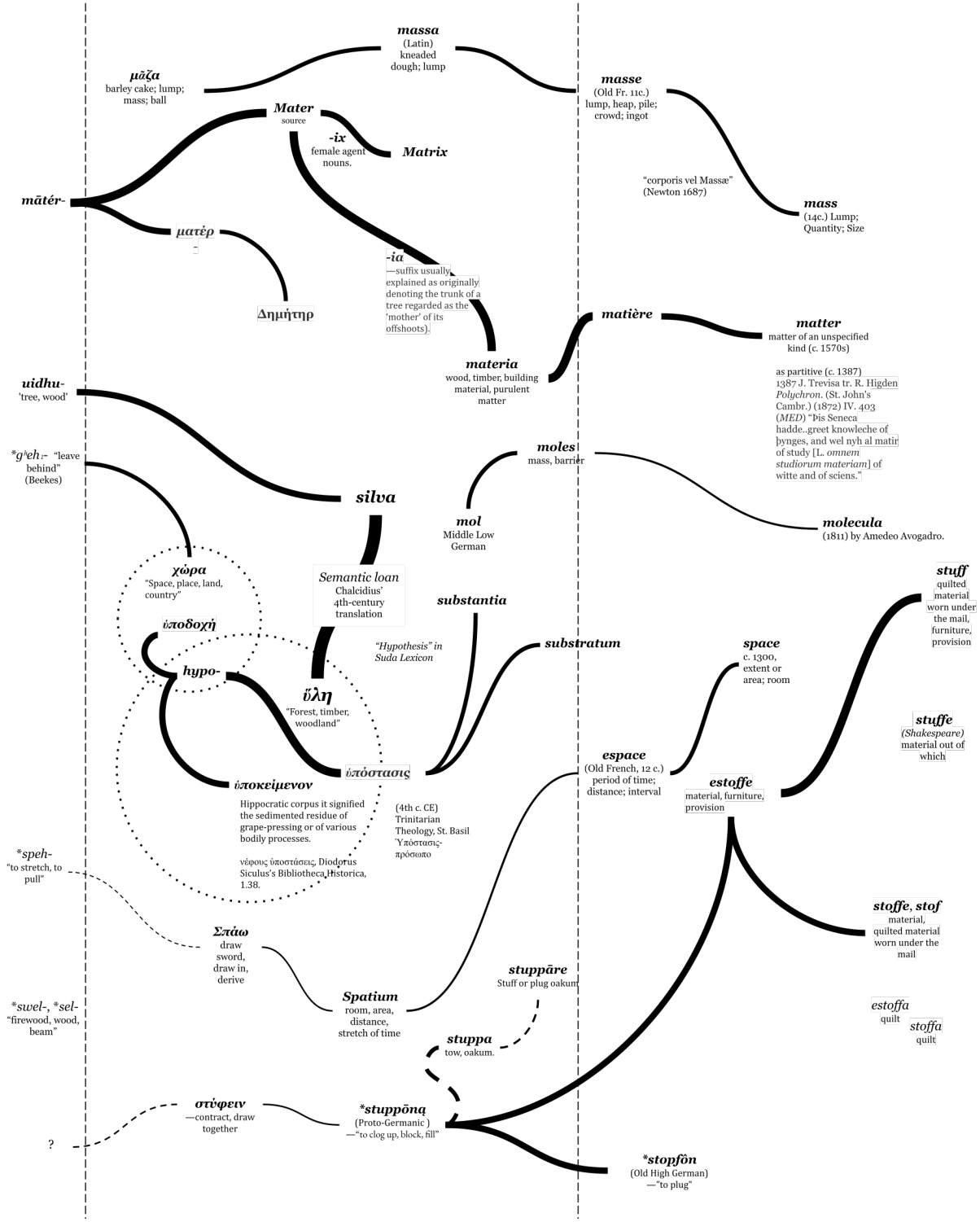

fig. 2 An etymological map within the semantic field of matter.

There were of course other illustrations that must have been circulating in the Academy. The later-period Platonic *Timæus* intimated materiality by: the liquid that forms a base for the various scents in a perfume; gold in relation various shapes forged; a mother's womb in relation to the progeny it carries within, all implying *receptacles* sustaining a variety of impressions or configurations.[39] In all these *substrata* the success of the receptaculary function was determined by their featurelessness. *The less intrinsic features a* substratum *came with, the more faithful the impression it received*: the inodorous liquid substrate of the perfumist, the amorphous lump of gold of the goldsmith, or even—from the point of view of a flawed embryology—the immaculate, totally passive womb that meant to carry forth, in all faithfulness, the active form of the male progenitor.

Though Aristotle's *πρώτη ὕλη* (also *ἐσχάτη ὕλη*; *ἀνείδεος ὕλη*), at least in the way Simplicius, Augustinus or Aquinas[40] understood it, has been disputed by twentieth-century scholars, both in scope and meaning,[41] the notion of the indeterminate *substratum* found indisputable applications in the Aristotelian theory of sensation and intellection. From the standpoint of a general theory of cognition, the pre-Cartesian notion of matter was based on the artifactual intuition of a sculptor or a painter. A painter is effectively impressed by the sensible species or likenesses of things whose matter has been removed or sifted out, only to reinfuse these forms in a new mater-

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[39] "διὸ καὶ πάντων ἐκτὸς εἰδῶν εἶναι χρεὼν τὸ τὰ πάντα ἐκδεξόμενον ἐν αὑτῷ γένη, καθάπερ περὶ τὰ ἀλείμματα ὁπόσα εὐώδη τέχνῃ μηχανῶνται πρῶτον τοῦτ᾽ αὐτὸ ὑπάρχον, ποιοῦσιν ὅτι μάλιστα ἀώδη τὰ δεξόμενα ὑγρὰ τὰς ὀσμάς: ὅσοι τε ἔν τισιν τῶν μαλακῶν σχήματα ἀπομάττειν ἐπιχειροῦσι, τὸ παράπαν σχῆμα οὐδὲν ἔνδηλον ὑπάρχειν ἐῶσι, προομαλύναντες δὲ ὅτι λειότατον ἀπεργάζονται. ταὐτὸν οὖν καὶ τῷ τὰ τῶν πάντων ἀεί τε ὄντων κατὰ πᾶν ἑαυτοῦ πολλάκις ἀφομοιώματα καλῶς μέλλοντι δέχεσθαι πάντων ἐκτὸς αὐτῷ προσήκει πεφυκέναι τῶν εἰδῶν. διὸ δὴ τὴν τοῦ γεγονότος ὁρατοῦ καὶ πάντως αἰσθητοῦ μητέρα καὶ ὑποδοχὴν μήτε γῆν μήτε ἀέρα μήτε πῦρ μήτε ὕδωρ λέγωμεν, μήτε ὅσα ἐκ τούτων μήτε ἐξ ὧν ταῦτα γέγονεν: ἀλλ᾽ ἀνόρατον εἰδός τι καὶ ἄμορφον, πανδεχές, μεταλαμβάνον" (*Timæus* 50e-51a).

[40] St. Augustine's *De Genesi contra Manichaeos* I:5–7); Simplicius (*On Aristotle's Physics* I.7); Aquinas (*De Principiis Naturæ* §13).

[41] Cf. *Appendix* to Aristotle's *Physics* Books I and II, trans. W. Charlton, "Did Aristotle Believe in Prime Matter?" (Oxford: Clarendo Press, 1983), pp. 129-145.

ial *substratum*, the medium of color. The whole arc of the painter's exchange with his environment resembles the process by which stamp impresses its shape onto a lump of wax, effectively transferring an emblem from one material medium to another. The fidelity of the stamping procedure, one may observe,—relies on a degree of matter-independence of the emblem[42]—just as any form of symbolic communication relies on the relative matter-independence of the symbol.[43] Similarly, the seal impressing its sigil in wax, either as an analogue for memory in Plato's *Theætetus* and Aristotle's *De memoria*, or an analogue of perception in Aristotle's *De Anima*, had become the classical analogue of cognition from the Golden Islamic period to the Latin High-Middle Ages and beyond: from Avicenna to Albertus, Aquinas and Dante, and then virtually all commentators of the *De Anima* down to the Renaissance. So we have Dante writing: "the highest love; and in her stance there were/ impressed these words, 'Ecce ancilla Dei,'/ precisely like a figure stamped in wax."[44] Similarly, we are reminded of Hamlet's plea, at the presence of his father's apparition to, to wipe away all past records and impressions from "the table of his memory" so that his father's commandment be retained forever:

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[42] If I am not able to convey a past event using the intelligible forms invoked in the other person's imagination through visible and auditory signs, the "you should have been there"—aspect, it is because the event was so firmly attached to the particular *substrata* that make it unique and the specific times that make it unrepeatable. And it is the mark of a keen writer to be able to evoke such an event in all its irreducible richness using an order of signs and the intelligible species that are naturally attached to them.

[43] The meaning of the word "information" in modern English deriving from the medieval English *enfourme* used to denote the reporting of facts, giving shape in general, and metaphorically carried across to the semantic field of thinking: to educate, report, or "give shape to" the intellect. Cf. *OED* entry for "information."

[44] Dante, *Purg*. Canto X, 43-45. Consider also Dante's assimilation of the analogy in: *Purg*. XVIII, ll. 22-24, 37-39: "Your apprehension draws an image from/ a real object and expands upon/ that object until soul has turned toward it;/ …and they are led to error by the matter/ of love, because it may seem—always—good;/ but not each seal is fine, although the wax is."—*Par.* 37-42: "The lantern of the world approaches mortals/ … and it can temper/ and stamp the world's wax more in its own manner."—*Purg*. VII, ll. 127-129: "Yet it is true that, even as a shape/may, often, not accord with art's intent,/ since matter may be unresponsive, deaf"—*Par.* VIII, ll. 127-128: "Revolving nature, serving as a seal/ for mortal wax, plies well its art." —Cf. *Conv*. 1.8.7; *ibid.* 2.10.5; 3.6.2.

Within the book and volume of my brain,
Unmixed with baser matter.[45]

This much is entailed in the classic passage(s) from the *De Anima* that presents the senses and their objects as receiving the same fulfillment, one being potentially the other. In fact, the whole medieval realism can be summed up in the view that there is some formal continuity of a sensible *datum* over different substrates. On a physical level then, referring the *same* quality found in the *anima* to a world *extra animam*, depends on the formal unity of that quality as an accident, across all *substrata* mediating between the inanimate source and animate target: fire; air; skin; organ; heart or brain., depending on where one places the seat of common sense [*κοινὴ αἴσθησις*].

Inversely, to the degree knowing a thing through sense or intellect is framed as a matter-removing process—cognition minimally defined as the ability of a subject to receive and contain more forms than those it naturally has—creating a thing should be understood, inversely, as a matter-infusing or embodying process. The terms are sufficiently versatile that, be it the process of realizing the ship-building skills and naval-engineering theory into an actual ship, or of realizing a stratagem into a decisive battle, or even passing on one's *εἶδος* to a progeny, all these productions can be interpreted philosophically as the imposition of a form or a complex of forms, onto a particular *substratum*.

To convey as much, however, we use a derivative of the participle *concretum* of the verb *concresco*, i.e. to bring together, to fuse two things as opposed to *abstraho*, i.e. to pull away. So, whether we realize it or not, every time we use the term 'concrete' we pay tribute to a very spe-

[45] *Hamlet*, Act 1, Scene 5, 92-110 in *The Tragedy of Hamlet, Prince of Denmark*, ed. A. P. Paton (Edinburgh: Edmonston & co., 1878), p. 22.

cific analysis of Being, whose trademark was this counter-intuitive *association of the empirically real with the composite*.[46] Something is concrete, i.e. fused together into a whole [*σύνολον*] [47]insofar as it is not removed from its necessary conditions of subsistence. An intentional *species* that lives in the imagination of, say, a ship-builder becomes concrete by imposing it into such-and-such pieces of wood, metal etc. at a particular time and place.

Ultimately, this picture suggests that the world is that more-or-less workable *subiectum* out of which we abstract interesting features, and into which, in turn, we realize our inner intentions, throughout this constant exchange of formal elements into and out of matter. As agents, we take the role of the seal, in the hope that our plans be faithfully translated into the "wax of the world" (Dante, *Purg*. I.41). But when the world makes an impression onto us, we retain and process that impression by taking the role of the wax.

It is important to note, that in contrast to the relatively featureless medium of perception, or the absolutely featureless subject of intellection, Aristotle's unprincipled use of *ὕλη* suggests a different picture for the "seal of the world." For it is in virtue of its intrinsic properties that timber makes a good structural material, subject to cutting, carving, bending, or to being modulated into a tectonic whole. Its very nature opens it up to a certain variety of forms as much as it wards it off from others. So if Plato's *χῶρα* signified the seedbed of the elements of this world before they get variously geometrized, Aristotle's *ὕλη* meant to signify *the potential dormant in any given level of complexity for further activation or natural completion*. So Aristotle's real contribution in the development of the notion of matter is not the *hypothesis* of some absolute *substratum*

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[46] This is exactly the sense meant to be conveyed through name of the Florentine *Accademia del Cimento* (est. 1657) which was devoted to the experimental study of natural phenomena, credited with one of the first lab manuals.

[47] The terms used by Aristotle in his writings *passim* are: *σύνολον*, *συνειλλημένον*, *σύνθετον*, *συνουσία*.

at the vanishing point of all intelligible description. Instead of the pure logical obligation to assign properties to subjects,[48] Aristotle argued that *specific forms of activity presuppose specific matters as a matter of natural fact*.

[48] To wit, the logical *substratum* that differentiates the attributes *extension*, from th*e extended thing*, as rejected by Descartes and reintroduced by John Locke.

.2 From sicut Simitas to sicut Eclipsis

As part of the new paradigm rising into prominence in the Latin West during the first half of the thirteenth century, this particular doctrine of matter prescribed that the scientifically crucial features of the natural world—the ones we may ultimately make a demonstrative science of—are bound to their determinate substrata in the same way the 'snub' is bound to non-uniform 'noses' or, more remotely, to uniform parts of 'flesh.'[49] We know this particular doctrine relied on a new ecosystem of concepts and arguments that had only become widely available through the twelfth-century Latin translations of the non-logical works of Aristotle along with Arabian and Jewish commentaries; and the task of bringing them into some form of conceptual equilibrium with the old ways of thought, claimed the effort and captured the philosophical imagination of many Christian thinkers.

This notion of matter was rooted in some *deep intuitions about the structure of our physical world and the productive arts we enrich it by*. There is no determinate action, say, cutting in the productive acts, or staying alive in the animal kingdom, whose performance does not necessitate some determinate matter. Cutting wood requires an instrument of such shape, roughness, hardness, coherence, malleability etc; while staying alive requires a particular bodily unity, which in turn requires such non-uniform (organs), and uniform parts (tissues) down to the mixtures and the powers of the elements in Peripatetic physics. There is no performance of such functions that can subsist or be defined as a pure form.

Supposing that in this matter-laden world of ours Being is expressed as *action and activity* [*ἐνεργεία*] *of some particular kind of stuff*, the physicist is the one to study attributes, functions

[49] *Physica* II.1; *Met*. Epsilon 1; *De Anima* I.1; *De Part*. *An*. I.1, 5.

and affections of such-and-such a body and such-and-such matter [*ὁ φυσικὸς περὶ ἅπανθ' ὅσα τοῦ τοιουδὶ σώματος καὶ τῆς τοιαύτης ὕλης ἔργα καὶ πάθη*, (*De Anima* I. 403b 10)]. But if the knowledge of any physical phenomenon necessitates a particular sensible matter then the study of concrete subjects will need to be demarcated according as they vary in both form and matter.[50]

However, viewing all kinds of phenomena as the enactments of such-and-such inherent potential meant that abstraction was serviceable only within certain limits, beyond which the intellect would no longer track how nature dispensed itself into determinate *substrata*; whatever further generalizations committed would only have an incomplete, non-concrete status that is found in analogical talking.[51] But if there can be no meaningful abstraction from the concrete realm and the sublunar world comes in genuinely distinct natural kinds, then the science of nature would need to be divided over as many disciplines as there are substrational divergences within the world. So, whatever we may know scientifically is to be sought after over a tapestry of non-overlapping fields of research, each studying different varieties or different aspects of the concrete.

These enmattered subjects of learning suggested themselves in opposition to attributes that contain no matter [what we may interpolate as *ahyloi logoi* in Greek, for 'unmattered' or 'immaterial'] in the model of the passions of the celestial bodies. Aristotle tells us in *Met*. Eta 4

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[50] Even worse, if the subject is considered part of the affection as matter (leaf-shedding *in* broad-leaved plants), the same manifest phenomenon might be liable to different explanations, through different middle terms. For example, longevity in birds might be due to a lack of bile, while longevity in quadrupeds is due to a dry constitution (*APo* 99b). So in the Aristotelian ideal of scientific definition longevity can never converge in one unified scientific meaning over birds and quadrapeds. Though it might bear the meaning of 'comparatively long life' in a pre-theoretical stage, and if the scientific definitions of these attributes contain the middle terms that prove them of their subjects, longevity should mean different things across different subjects.

[51] The idea, for example found in both Aritotle (*De Anima* 412b) and A. Cæsalpino's *De plantis* that plants have the same vegetative soul as animals, and that plants may be studied as upside-down animals with their reproduction organs on the top and their intestines below. This analogical thinking was also sanctified by Francis Bacon, *Novum Organum* II.XXVII.

accidents such as eclipses do not have matter; rather, it is the subject, i.e. 'moon' that serves as their *substratum*.[52] In defining the lunar eclipse as a reasoned fact, we predicate the nominal definition of 'eclipsis,' i.e. 'deprivation of light' of 'the moon,' by reason of 'the interposition of the earth between the moon and the sun.' The 'eclipse,' can be understood as a phenomenon that obtains between a light source and any two other bodies in relative position. They may be the actual moon and the sun, or two spheres in an armillary sphere, or even two spherical solids in geometric imagination, irrespective of whether it is embodied in aetherial, or terrestrial, or even just intelligible matter. Or, as John Dee wrote:

> the heauenly spheres, & sterres their sphericall soliditie, with their conuex spherical superficies, to the earth at all times respecting ... as also the whole earthly Sphere and globe it selfe, and infinite other cases, concerning Spheres or globes, may hereby with as much ease and certainety be determined of, as of the quantitie of any bowle, ball, or bullet, which we may gripe in our handes.[53]

In these Peripatetic terms, the era in focus, 1547-1710, witnesses a gradual transition from an idea of nature where everything is said *sicut simum* (Chapter II) to one where everything is said like *sicut curuum* or *sicut eclipsi* (Chapter III).

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[52] Such accidents that need no matter in potency, like passive qualities do and which always denote some substance suffering it, Averroës had taken them to be predicated of a matter in act, like the moon or body, that is, some actual and separable substance being subjected to them as matter.

[53] John Dee, second addendum to: *The Elements of Geometrie of the most auncient Philosopher Evclide of Megara*, trans. Henry Billingsley (London: lohn Daye, 1570), 389v.

.3 From Part to Thing

If all philosophers after Descartes understood by 'matter:' an 'external world,'[54] a world 'considered in itself [*prout in se ipso sit*];'[55] or 'the world outside us'[56] and 'without us'[57] or 'without thought;'[58], that 'outward,'[59] 'stupid, thoughtless *Somewhat*,'[60] 'oppoſite to ſpirit or mind,'[61] it was because materiality had already been reframed as the absolute antithesis of mentality. But such a mutual exclusivity of world and self would not be possible or even relevant to pre-Cartesian discourse, prior to the radical contraction of the self into the attribute of *cogitatio*.

Indeed, when a High-Medieval or Renaissance magister referred to a 'material world' he really meant the 'world of enmattered forms.' In that world, things would take place 'in' matter and, inversely, aspects of things would be abstracted 'out of' their material circumstances [*conditiones materiales* Thomas called them] in the same way the emblem of the seal is transferred out of its iron and onto the wax. Natural beings were said to 'possess' matter, and be 'individuated

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[54] Robert Boyle, *Origine* p. 101 et alibi. Arthur Collier understood by world "whatſoever is uſually underſtood by the Terms, *Body*, *Extenſion*, *Space*, *Matter*, *Quantity*, &c" and by external, he understands "Absolute, Self-existent, Independent" *Clavis Universalis: or, a New Inquiry after Truth*. *Being a Demonstration of the Non-existence, or Impossibility, of an External World* (London: Robert Gosling, 1713), Introduction, p. 2.

[55] William Hamilton's notes in Vol. II of *The Works of Thomas Reid Now Fully Collected, with Selections from His Unpublished Letters*; *Preface, Notes and Supplementary Dissertations by Sir William Hamilton* (Edinburgh: Maclachlan & Stewart, London: Longman, Green, ... 1872), p. 807A.

[56] "And we learn that He has made two worlds: one outside us (whose essence is expressed by the most vehement, extremely diverse, and perfectly-ordered motions of the various parts of its extension); and the other within us, far more beautiful and refined, which is expressed in extremely diverse and unsurpassably marvellous images and forms of light and infinite colours, of tastes, scents, sounds, and so on (Arnold Geulincx, *Ethica* II.3, §9, 84, as trans. in *Arnold Geulincx: Ethics, with Samuel Beckett's notes*, eds. Han van Ruler, Anthony Uhlmann; trans. Martin Wilson [Leiden: Brill, 2006])"

[57] Robert Boyle, *The Second Part of the Christian Virtuoso* (Savoy: E. Jones, 1690-1), Aph. to subj. 2. Also, "bodies without them [Sensories], *The Origine of Formes and Qualities*, §7, p. 100.

[58] George Berkeley, *Commonplace Book*, 105r, in *The Works of George Berkeley, Bishop of Cloyne*, ed. A. C. Fraser (Oxford: Clarendon Press, 1901) I: p. 60.

[59] *A Treatise Concerning the Principles of Human Knowlege* (Dublin: A. Rhames, 1710) Part I, §15, p. 56.

[60] George Berkeley, *Principles*, I: §75, p. 120.

[61] Berkeley, *Siris: A Chain of Philosophical Reflexions and Inquiries Concerning the Virtues of Tar Water*, (Dublin; London: 1744), p. 139.

by' it in its quantifiable state [*materia signata*]—just as the multiplication of the emblem relies on spatially distinct pieces of wax—while they themselves could also serve as 'the matter for' some further act [*ratio materiæ*]. For better or for worse, 'matter' used to be a notion indeterminate enough to map across metaphysical as much as epistemological considerations, while it also remained grammatically flexible enough to appear in adverbial (*materialiter*) or adjectival form (as in *forma materialis*), aside from its main nominal use (*materia*) and its various qualifications (*prima*, *signata*, *secunda* and *communis*).

This world, as bounded within the sublunary sphere of the Ptolemaic universe, contained all beings together with such aspects and actions whose performance necessitated a determinate material substratum. As the previous section discussed, activities like that of hammering nails into wood, for instance, necessitate a tool of such-and-such specifications, material (hardness, sharpness) and dimensional (saw-toothed).[62] Other acts, like the essence of the sphere, could be considered independently of any sensible material they might inform,[63] even if they too necessitated some sort of *substratum* to be presented *ἐντελεχείᾳ* to the geometer's faculty of imagination,

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[62] *Physica* II, 200a ff.: "διὰ τί ὁ πρίων τοιοσδί; ὅπως τοδὶ καὶ ἕνεκα τουδί. τοῦτο μέντοι τὸ οὗ ἕνεκα ἀδύνατον γενέσθαι, ἂν μὴ σιδηροῦς ᾖ· ἀνάγκη ἄρα σιδηροῦν εἶναι, εἰ πρίων ἔσται καὶ τὸ ἔργον αὐτοῦ. ἐξ ὑποθέσεως δὴ τὸ ἀναγκαῖον, ἀλλ' οὐχ ὡς τέλος· ἐν γὰρ τῇ ὕλῃ τὸ ἀναγκαῖον, τὸ δ' οὗ ἕνεκα ἐν τῷ λόγῳ."—*Met*. 1044a 25 ff: "ἐνίων δ' ἑτέρα ἡ ὕλη ἐξ ἀνάγκης ἑτέρων ὄντων, οἷον πρίων οὐκ ἂν γένοιτο ἐκ ξύλου, οὐδ' ἐπὶ τῇ κινούσῃ αἰτίᾳ τοῦτο: οὐ γὰρ ποιήσει πρίονα ἐξ ἐρίου ἢ ξύλου."—*De Part.* 642a 9ff: "Τοῦτο δ' ἐστὶν ὥσπερ ἐξ ὑποθέσεως· ὥσπερ γὰρ ἐπεὶ δεῖ σχίζειν τῷ πελέκει, ἀνάγκη σκληρὸν εἶναι, εἰ δὲ σκληρόν, χαλκοῦν ἢ σιδηροῦν, οὕτως καὶ ἐπεὶ τὸ σῶμα ὄργανον (ἕνεκά τινος γὰρ ἕκαστον τῶν μορίων, ὁμοίως δὲ καὶ τὸ ὅλον), ἀνάγκη ἄρα τοιονδὶ εἶναι καὶ ἐκ τοιωνδί, εἰ ἐκεῖνο ἔσται."

[63] *Met*. Zeta, 1035a 4ff: "Οἷον τῆς μὲν κοιλότητος οὐκ ἔστι μέρος ἡ σάρξ (αὕτη γὰρ ἡ ὕλη ἐφ' ἧς γίγνεται), τῆς δὲ σιμότητος μέρος· καὶ τοῦ μὲν συνόλου ἀνδριάντος μέρος ὁ χαλκὸς τοῦ δ' ὡς εἴδους λεγομένου ἀνδριάντος οὔ."

in this case quantity serving as intelligible matter [*ποσόν συνεχές*, *ὕλη νοητή*].[64]

Similarly for Thomas, the physical world contained living beings that relied on a more-or-less *determinate substratum* for dispensing their functions—in the manner a specific sense relies on a corporeal organ, or the entire soul [as *forma corporis*] relies on an articulated body [*materia communis*], for which reason they are both said to be "organic," i.e. instrument-like. In the same manner these non-uniform organs necessitated a particular *substratum* of uniform parts, these humors too relied on the *substratum* of the four elements [*materia secunda*]. Finally, all organisms, at any given level of complexity or range of their environment, relied on an *absolutely indeterminate substratum* [*materia prima*] for carving off unique trajectories of their individual lives. Far from being absolutely external to *mens*, the pre-Cartesian notion of *corpus* was implicated within the *per se* unity of a living self. In other words, the pre-modern version of matter actually formed *part of* whatever was activated into, and of every unique frame of the history of its existence, across any of its levels of determination, *prima*, *secunda*, and *communis*.

For the same reasons, Thomas Aquinas (1225-1274)—the man who imbued the new comprehensive system of Christian philosophy with these Peripatetic insights—could call 'soul' [*anima*] a particular substance [*substantia particularis*] but not a *hypostasis* or a *persona*, since it did not have the *complete nature* of a species. "My soul is not I [*anima mea non est ego*]" claims Thomas,[65] and the soul formed no less an arbitrary subdivision of the human species than

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[64] *De Caelo*, 277b -278a ff.: "ἐν ἅπασι γὰρ καὶ τοῖς φύσει καὶ τοῖς ἀπὸ τέχνης συνεστῶσι καὶ γεγενημένοις ἕτερόν ἐστιν αὐτή τε καθ' αὑτὴν ἡ μορφὴ καὶ μεμιγμένη μετὰ τῆς ὕλης· οἷον τῆς σφαίρας ἕτερον τὸ εἶδος καὶ ἡ χρυσῆ καὶ ἡ χαλκῆ σφαῖρα, καὶ πάλιν τοῦ κύκλου ἑτέρα ἡ μορφὴ καὶ ὁ χαλκοῦς καὶ ὁ ξύλινος κύκλος· τὸ γὰρ τί ἦν εἶναι λέγοντες σφαίρᾳ ἢ κύκλῳ οὐκ ἐροῦμεν ἐν τῷ λόγῳ χρυσὸν ἢ χαλκόν, ὡς οὐκ ὄντα ταῦτα τῆς οὐσίας· ἂν δὲ τὴν χαλκῆν ἢ χρυσῆν, ἐροῦμεν, καὶ ἐὰν μὴ δυνώμεθα νοῆσαι μηδὲ λαβεῖν ἄλλο τι παρὰ τὸ καθ' ἕκαστον.—*Met.* 1061a 28-33: "ὁ μαθηματικὸς περὶ τὰ ἐξ ἀφαιρέσεως τὴν θεωρίαν ποιεῖται (περιελὼν γὰρ πάντα τὰ αἰσθητὰ θεωρεῖ, οἷον βάρος καὶ κουφότητα καὶ σκληρότητα καὶ τοὐναντίον, ἔτι δὲ καὶ θερμότητα καὶ ψυχρότητα καὶ τὰς ἄλλας αἰσθητὰς ἐναντιώσεις, μόνον δὲ καταλείπει τὸ ποσὸν καὶ συνεχές."

[65] *In Epistolam I ad Corinthios Commentaria*, c. 15, lectio 2, §924. In Vol. 21 of *Opera omnia* (Paris: Vivès, 1876), pp. 33-34, 41-52.

a hand or a foot does,[66] of the human body. In investigating the physical extents of the soul through experience, a psychologist ought to rely on all latent continuities among natural kinds and their gradations in both structure and function. Such a project would reveal a unity among humans not only of reason and language, but also of organic structure, flesh, bone, liver, heart and brain. So, the set of powers and functions ascribed to the human species needs to involve a *materia communis*, a commonality of organic structure. In short, the *anima* formed a part of what really subsisted in nature, that is the whole *hypostasis* or the human *persona*.[67]

This metaphysics was generated in a philosophical tradition that conceptualized units of Being, from their generation to their corruption, through the *logoi* of their incomplete parts. In a science of the Being qua changing, i.e. natural philosophy, we study *instances of complete beings through the internal relations of their incomplete metaphysical parts*. As incomplete, *the meta-physical boundaries of these parts do not coincide with their physical boundaries*, in the same way a severed hand is not, strictly speaking, a hand but only equivocally speaking. Just as the individual Socrates was thought of as a constant concretion of infra-personal terms, body and soul, or in Aquinas, primitive matter and substantial form, any substance would be conceived through infrasubstantial parts, below the threshold of a concrete subject.

Contrast this with the view of the early moderns that such composition of soul and body was no less chimerical than combining the higher part of the human with the lower part of the

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[66] "… non quaelibet substantia particularis est hypostasis vel persona, sed quæ habet completam naturam speciei. Unde manus vel pes non potest dici hypostasis vel persona. Et similiter nec anima, cum sit pars speciei humanae" (*ST* Ia Q75.A4, ad 2).

[67] The *intellectus* indeed was perceived to be immaterial or inorganic by Thomas, both for *a priori*, conceptual and doctrinal, and *a posteriori* reasons. But though its immateriality held the promise of a divinely-conserved personal identity until the final resurrection of the body, the intellective soul was still considered a power of the living soul, a very complicated and interesting act at that, but of an organized body nevertheless.

horse,[68] or that it is no less distinct from the whole body than blood is from bone[69] and that whatever power kept the *mens* united with a *corpus* for the duration of this life, it obtained on a higher level.[70] John Smith, the Cambridge Platonist, considered the idea of *material forms by some "hot-brained Peripateticks*" to be a mere contradiction of terms, having jumbled under the term *Material Forms*, "a new kind of Being, never anciently heard of, between the parts of a Contradiction, that is *Matter* and *Spirit."*[71]

Now, even though there was a clear-cut divide between the world *extra animam* and that part of the corporeal world that stood under the influence of each substantial form for as long as they constituted something living, there was *nothing in the pre-Cartesian worldview to suggest that matter ended exactly where the self began*. In fact, the organs as well as the *stimuli* they collected on behalf of the sensitive part of the soul were part of the fabric of the extramental world. Just as there were sensible species, like the feeling of heat in this fire, that existed *extra animam* as they existed in the *anima sensitiva*, there also were spiritual qualities *extra animam*, like the light emitted by the same fire, that existed in the medium as they existed in the soul.

In contrast, having eliminated this traditional overlap between thought and matter over the composite self, the early moderns could make the two fundamental distinctions line up to

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[68] "[F]ormarunt ejus ideam partim corpoream, partim spiritualem, non minus ridiculam, quam quæ eft chimærarum, & hippocentaurorum" (Louis de la Forge, *Tractatus de Mente Humana, Ejus Facultatibus & Functionibus*, ... [Amsterdam: Danielis Elzevirium, 1669], p. 7, in the Latin translation of *Traite de L' Esprit de l'Homme de ses Favultez et Fonctions*, … [Paris: M. Bobin & N. Le Gras, 1666].

[69] René Descartes, *Regula* XII, AT X: 15; CSM I: 42.

[70] Whereas Descartes posed a higher order unity of *mens* and *corpus* in the *Principia*, as the *per se* subject of appetites, passions, sensations etc. Geulincx held that the union of body and mind is a *secunda notio* (*Metaphysica Vera*, I.10 in *Opera Philosophica*, edited by J. P. N. Land, vol. II (Hague: M. Nijhoff, 1892), pp. 154-155.

[71] He continues by saying: "[W]e shall as carelesly lay it aside, as they boldly obtrude it upon us, and take the common distinction of all *Substantiall Being* for granted, viz. That it is either *Body*, and so *Divisible*, and of three dimensions; or else it is something which is not properly a *Body* or *Matter*, and so hath no such Dimensions as that the Parts thereof should be crouding for place" (John Smith, "Immortality of the Soul," Ch. II, in *Select Discourses*, ed. John Worthington [London: Printed by J. Flesher, 1660], Ch. II, pp. 108-9).

each other. In Descartes the world ends and the self begins at the same point matter ends and thought begins (fig. 3). As a result, the realm beyond the self became coextensive with the world beyond the mind.

This new world was of course ultimately premised on what Descartes perceived as a deep ontological divide or—in the Scholastic theory of distinctions—a *distinctio realis* between soul and body, matter and thought. Whatever higher-level unity they may be part of, the distinction between soul and body held in *rerum natura*, in the absolute manner one thing or person subsists independently from any other thing or person.

It is true that in response to Arnauld, *Secundæ Responsiones*, Descartes treats the mind and the body as *incomplete*, in the analogy of a hand when considered in itself and not in relation to the whole corporeal self.[72] Notwithstanding how severe we take this distinction to be, however,—from the absolute way Paul is other than Peter, to the way the blood is different from bone [*Regula* XII] to the manner the hand can be considered apart from the body—the spatial metaphor of 'underneath and over' seems to have given way to that of 'an inside and outside.'

[72] "Ita manus eſt ſubſtantia incompleta, cùm refertur ad totum corpus cujus eſt pars; ſed eſt ſubſtantia completa, cùm ſola ſpectatur. Et eodem plane modo mens & corpus ſunt ſubſtantiæ incompletæ, cùm referuntur ad hominem quem componunt; ſed, ſolæ ſpectatæ, ſunt completæ" (AT VII: 222, CSM II: 157).

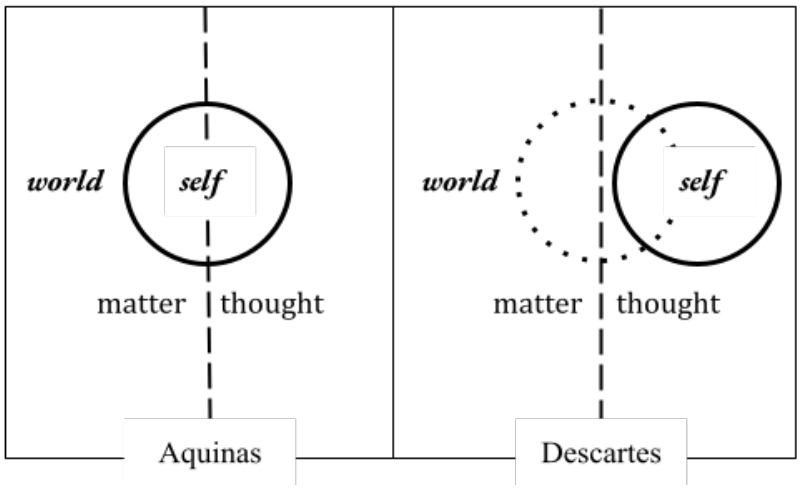

fig. 3 Diagram of the historical displacement of distinctions between world-self and matter-thought

.4 Degrees of Materiality; Degrees of Certainty

Where Cartesian philosophy was premised on the *real distinction* between soul and body, matter and thought (whatever higher unity they may be part of), the Thomists admitted a *spectrum* of materiality. In the Thomist synthesis, matter assumed the role of a differentiator in all three principal areas of Peripatetic inquiry: metaphysics, theory of sensation and of mind, and the theory of science: in regards to metaphysics, it made possible a *continuum of perfection*—from prime matter, to stone, plants, animals, men, to angels of varying degrees of purity and finally God. By correspondence, matter made possible a continuum of cognitive power [*vis cognitiva* or *cognoscitiva*] from the more material forms of cognition to the less immaterial; from the plant that is affected most materially and is therefore incognizant, to animal, the human being, up to the hierarchies of the angels and finally God, who is said to know everything immaterially and through His essence. Finally, matter suggested a continuum of certainty or exactitude (*ἀκριβολογία*) and dignity among the scientific disciplines.

Now, while Chapter I below will outline the role of matter in making possible degrees of perfection and of cognitive power, Chapter II will focus on the theory of science and the admittance of corresponding degrees of exactitude. Chapter III will focus on how the same three functions of matter we discussed in chapters I and II suggested three different directions of "dematerialization" for Descartes. For (1) where that original *ordo universi* spanned from prime matter, to stone, plants, animals, men, to angels of varying degrees of purity and finally God, Descartes adopts a much leaner *ordo realitatis* comprised of finite and created substances and their modes, and the infinite and uncreated substance. What is more, (2) where there was a corresponding spectrum of *vis cogniscitiva*, from the more material forms of cognition, plants, to the absolutely

immaterial, God, Descartes adopts an all-embracing attribute of *cogitatio* that sharply marks human beings off against an incognizant environment. Finally, (3) instead of an order of sciences by their ascending certainty, Descartes introduces an all-encompassing *mathesis* or *sapientia universalis* bearing on the same requirement of utter certainty regardless of the materiality of the subject.

Aquinas	***Descartes***
A continuous scale of Being spanning from prime matter to God.	A much leaner and discontinuous scale of Being.
A corresponding spectrum of cognitive power, from the more material forms of cognition, up to the absolutely immaterial mode of divine understanding.	A much leaner scale of Being of created substances, their modes and an uncreated substance.
An order of sciences [*ἐπιστῆμαι*] by their exactitude, inversely proportional to the materiality of its subject matter.	A general notion of *mathesis* over and beyond any substrational limitations.

.5 The Abodes of the Singular and the Universal

Looking for the principles of distinction between mind contents and world contents as propounded by Aquinas and his followers, one sees it was ultimately based on a brute distinction between two *substrata*. If the wax-and-seal analogue that provides a physical model of cognition as the unity of the formal content (emblem) across different *substrata* (from seal to wax) also provides a metaphysical explanation of veridical sensation, what should the explanation be about the truthfulness or at least word-directedness of our intellectual contents, i.e. the fact that they are about something existing, even though they might just not be getting it right? What happens on the side of Being when someone comes to truly grasp a denizen of the physical world?

This problem of course troubled philosophers long before Aquinas, as it did long after him. What can be said to have remained stable however is an axiom reported by Avicenna (980-1037), the Arabian iatrophilosopher of the Islamic Golden Age (c. 8th-13th), in his *Metaphysics of Healing*, ch. X, that became very popular among the Latin-speaking philosophers: the intelligible nature of a thing (Aquinas called it *natura absoluta*, or *conceptus quidditativis*) is received in the manner of the receiver [*recipitur modo recipientis*]; one subject, prime matter, imparting it individuality; the other subject, the intellect, imparting universality.

The same nature as it exists *per se* is neither singular nor universal (and, for the present purposes, it can be to reside in God's mind as one of its ideas). It is rather further enriched with the intention of singularity or universality out of the particular substrate it is found in. Human nature then, neither singular nor universal in itself, exists as a singular upon its inherence in prime matter, Socrates, and as a universal upon its inherence in the passive intellect, human species or Socrates's nature outside of history. Ultimately, if the intellect was called "the abode

of the universal," prime matter could be described as "the abode of the singular." After all, this generalized *substratum* theory, allowed Averroës (1126-1198)—the Andalusian polymath which earned the moniker "The Commentator"—as it also allowed Aquinas after him, to view the function of the passive or potential intellect [*intellectus possibilis*] in analogy to prime matter: *The possible intellect is related to the intelligible forms as prime matter is related to sensible forms.*[73] But some of these statements of Thomas were shown by Franciscans to lead to conclusions that were condemned in 1277-9.[74] For, how could a separated human soul know the particular sins to be atoned for in the Purgatory, if the earthly body it is separated from is the very condition for knowing the particular? And even worse, how would one human soul be distinct from another if they do not differ in species (like the angelic ones do) and all the historical particulars that make up a self have been left behind in the deceased body? Without the body, the human soul would be navigating aimlessly a sea of universals as it were, no sense of *hic et nunc*, much less a sense of self. Just as prime matter needs to be completed by one or the other form so that it may subsist in the composites, the human possible intellect too, as opposed to angelic intellects, need to be

[73] "… intellectus possibilis eius se habet ad formas intelligibiles sicut materia prima, quæ tenet ultimum gradum in esse sensibili, ad formas sensibiles, ut Commentator in III de anima dicit" [*Opusculum De Ente et Essentia.* Series Philosophica, No. 6, ed. Carolus Boyer (Rome: Aedes Universitatis Oregorianae, 1970], Ch. IV, §10, pp. 44-45. Cf. *ST* Ia Q14.A2; Q55.A2, c1-2; Q87.A1; *QdA* A2.1. 44).

[74] See Chapter I for the case of William de La Mare, a Franciscan opposing Aquinas and the Dominican order by such an argument.

completed in the same manner.[75]

There is really no way to retrospectively appreciate the transformation of the notion of matter, without reminding ourselves that as opposed to the Cartesian matter that was demarcated as the world external to thought, *the most enduring criterion of extramental existence before Descartes was first and foremost singularity or particularity.* That only particular things exist [*eæ quæ actu existunt sunt individualia*], or conversely, that universals do not exist was raised to a self-evident axiom used in academic disputations throughout the Aristotelian commentary tradition, ever since the European universities veered away from Platonic realism.

By contrast, Descartes included in the fold of the attribute *cogitare* all sorts of ideas and affections insofar as they are modes of a thinking substance but irrespectively of their representational content. In total opposition to Plato, Descartes's idea as the form of any kind of thought

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[75] Aquinas seemed to have offered a line of defense in Q79.A6, where he discusses intellectual memory. In this passage he argues that, though the separated soul can neither sense the particular—because it is separated from its body—nor understand it, because the proper object of the intellect are absolute natures, still, contra to Avicenna, there can be a sort of habitual knowledge left in the intellect of its embodied life. It has retained vestiges of intelligible species [*vestigium praecedentis cognitionis seu affectionis* (Q89.A8, c 1), midway between potency and act [*aliquando medio modo se habet inter potentiam et actum* (Q97.A6, ad 3] that allows the intellect to remember, not the actual objects it once sensed and imagined the memory of which requires a corporeal faculty of receiving and retaining, but the individual acts of understanding that once accompanied the species of those objects in time. "[P]raeteritio potest ad duo referri, scilicet [a] ad obiectum quod cognoscitur; et ad cognitionis actum. Quae quidem duo simul coniunguntur in parte sensitiva, quae est apprehensiva alicuius per hoc quod immutatur a praesenti sensibili, unde simul animal memoratur se prius sensisse in praeterito, et se sensisse quoddam praeteritum sensibile. Sed quantum ad partem intellectivam pertinet, praeteritio accidit, et non per se convenit, ex parte obiecti intellectus. … [I]deo sicut intelligit seipsum intellectus, quamvis ipse sit quidam singularis intellectus, ita intelligit suum intelligere, quod est singularis actus vel in praeterito vel in praesenti vel in futuro existens. Sic igitur salvatur ratio memoriae, quantum ad hoc quod est praeteritorum, in intellectu, secundum quod intelligit se prius intellexisse, non autem secundum quod intelligit praeteritum, prout est hic et nunc." (Q79.A6, ad 3); More on the knowledge of the separated soul: "Animae vero separatae non possunt cognoscere per huiusmodi species nisi solum singularia illa ad quae quodammodo determinantur, vel per praecedentem cognitionem, vel per aliquam affectionem, vel per naturalem habitudinem, vel per divinam ordinationem, quia omne quod recipitur in aliquo, determinatur in eo secundum modum recipientis" (Q89.A4, c 1)—"Cum igitur species intelligibiles maneant in anima separata, sicut dictum est; status autem animae separatae non sit idem sicut modo est, sequitur quod secundum species intelligibiles hic acquisitas, anima separata intelligere possit quae prius intellexit; non tamen eodem modo, scilicet per conversionem ad phantasmata, sed per modum convenientem animae separatae. Et ita manet quidem in anima separata actus scientiae hic acquisitae, sed non secundum eundem modum" (Q89.A6, c 1)—"Quia anima separata cognoscit singularia per hoc quod quodammodo determinata est ad illa, vel per vestigium alicuius praecedentis cognitionis seu affectionis, vel per ordinationem divinam" (Q89.A8, c 1); cf. Q97.A6, ad 3.

[*cujuslibet cogitationis formam*][76] became as particular as the mind it existed in, independently of whether it is *about* singular things or universal things, sensible or intelligible, volitional or affective states. In the Late Scholastic-Cartesian terminology the life of the mind was a sequence of a particular modes of thought [*formaliter*] regardless of their representational capacity [*obiective*]. But though Descartes subsumed singular acts of sensing, properly and commonly, and imagining, under *perceptio*, i.e. the operation proper to *intellectus*,[77] their pre-Cartesian understanding placed such particular acts outside the *intellectus* and to a more material form of cognition. In that way, the distinction between *sensibilia* and *intelligibilia* was orthogonal to the distinction between the particular and the universal.

In contrast to the attribute of *cogitare*, the pre-modern criterion of mental activity, of *intelligere*, consisted strictly in the manipulation of universal content; *species*, *intentiones* or *conceptus*. So, by the time we reach Berkeley's time, the attribute of *immateriality* had already transformed from a necessary condition for any kind of cognition (conscious or not) which allows a soul partly be a *locus specierum* [*τόποϛ εἰδῶν*, *De Anima*, 429 a10] to the conscious side of whatever may be presented to the mind, be it particular or universal, active or passive [*Cogitationis nomine, intelligo illa omnia, quæ nobis conſciis in nobis fiunt, quatenùs eorum in nobis conſcientia eſt* (*Principia* I: IX].

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[76] "Idea nomine intelligo cujuslibet cogitationis formam illam, per cujus immediatam perceptionem ipsius ejusdem cogitationis conscius sim" (AT: VII 160).

[77] *Principia* I: IX, XXXII, ILVIII, AT VIII-1: 7, 17, 32, CSM I: 195, 204, 209; Cf. *Secundæ Responsiones*, (AT VII: 160, CSM: 113): *Cogitationis nomine complector illud omne quod ſic in nobis eſt, ut ejus immediate conſcii ſimus. Ita omnes voluntatis, intellectûs, imaginationis & ſenſuum operationes ſunt cogitationes*.

.6 Outline

Chapter I, on *Matter, Order, and Cognition*, goes on to show that this predominantly Aristotelian-Thomist (and to some degree Averroist) doctrine of matter that lasted down to the Renaissance, was the product of *a systematic attempt to normalize the perceived shortcomings of human cognition by pairing it with a material world as its proper object*. The human condition formed a crucial piece in the fulfillment of an order of creation, a *scala naturæ* that ranged from pure potentiality, *prima materia*, to pure activity, the *actus purus*. If such an "amphibious" plane of existence had not been materialized, the world would be incomplete and that would impute a case of cosmic injustice on the part of an all-powerful being. But Thomas is credited with protracting the spirit of the same theodicy into matters epistemological.

> For in a world where the measure of knowing power [*vis cognitiva*] was proportional to the measure of perfection, the dignity of the human being was tied to its unique point-of-view: among all substances capable of reason, humans have the unique ability and duty to extract intelligible content out of a world external to themselves. The proper object of that uniquely human form of cognition in *vita præsentia* was material reality [*quidditas in materia corporali existens* (Q84.A7, c.)]. The human mind and material reality were in effect made for each other. And to seek for forms of knowledge or a source of certainty from a different source than these preestablished points of contact with *ea quæ sunt extra* (Q94.A2, c. 3) would be to ask for the impossible.

Now, whether posed merely as an ever-remote ideal, or a long-term project for the bettering of human knowledge, Aristotle had speculated that a scientific understanding of a subject would require a system of apodeictic syllogisms, demonstrating effects from real, immediate,

better known, and universal causes. But, how does man's embodiment, no matter how natural, affect the range of this scientific knowledge and its evidential value? Chapter II, on *Matter, Certainty, and Truth* investigates the association of material reality with uncertainty as highlighted in a mid-sixteenth-century debate surrounding the status of the abstract disciplines of the day against the concrete ones, instigated by the publication of a commentary by Alessandro Piccolomini in 1547. If the intellectuals of the day were becoming increasingly interested in the Proclean notion of *mathesis universalis*, the debate on the certitude of the abstract disciplines marks the starting point of a current of thought that would culminate in Andrianus Romanus's 1597 commentary and Descartes's *Regulæ* (1619, 1628).

Piccolomini argued in this brief essay (*De certitudine mathematicarum disciplinarum*) that the certainty attained in mathematics has to do with the matter-independence of their demonstrations. If geometric or arithmetical subjects are grasped *per sui essentias* along with everything that may be deduced from their natures, it is because the truths they suggest are not tied to any material substratum. But if all nature is said 'like the snub' [*sicut simum*], all natural phenomena presuppose a determinate substratum in the same manner the 'snub' presupposes a 'nose,' the natural philosopher is compelled by the very nature of their subject to study affections like 'curvature' [*curuitas*] *in concreto* or *καθ' ὑποκειμένου*, as manifested in this or that flesh. If this is how nature is to be inquired into, the matter-independence of mathematical demonstrations to which they owe their exactitude is also what makes them unfit to account for any natural operation. The controversial conclusion reached in the commentary is that mathematics actually falls short of the venerable ideal of demonstrative science [*ἐπιστήμη ἀποδεικτική*] as expounded in Aristotle's *Analytica Posteriora*. For whatever undeniable exactitude obtains in its attenuated

subject matter, it could only be due to its dealings with the surface-effects of our reality, many removes away from the actual subjects reality is dispensed in and which scientific knowledge ought to make reference to.

Ultimately, there did not seem to be any way of reconciling the certainty experienced in the private worlds of abstract imagination and the concrete reality of the public world. If that external world can exist in our minds through its semblances and not through its essence, there is no hope of ever acquiring scientific knowledge of the attributes the world manifests itself to us by. And though geometric essences can exist in the mind as they exist in prime matter, they cannot account for the inner being of substances. Keeping in line with Thomas's apologetics for the human understanding from Chapter I, *if there were a natural* substance *that could exist in our intellect exactly as it existed in the real world,* per sui essentiam, *it would certainly not be of our world; and if there were a mode of cognition that would render the intrinsic nature of our sensible world known as evidently as those subjects of geometry, that would certainly not be human*.

And yet, Chapter III: *Matter and Self* finds Descartes introducing the "scientific fiction" of a world where neither the knower nor the object of her knowledge are matter-bound; a view that dispenses with the material *substratum* from both ontological and epistemological considerations. In such a view, the world could actually be studied as an immaterial object, i.e. a pure form, or an attribute—something that Chapter II declared as impossible; from the point of view of an equally immaterial soul, i.e. a pure intelligence—something that Chapter I showed humans were not supposed to possess. With this move, the gap drawn earlier between the certain and the true is bridged. The model for this direct acquaintance with an object is of course none other than a subject's acquaintance with its own self, i.e. the Cartesian *cogito*.

But according to Chapter I, where the external world is posited as the immediate and proper object of the human *intelectus*, any capacity for self-reflexion would be operationally tied to the material world, the phantasms. Such was the natural bond between the human soul and the world that the mind could not reflect on a pure self prior to its acquaintance with the material world. The intuitive truth of the *cogito*—which had been framed in Thomist terms as knowledge of one's own self through its essence [*per sui essentiam*], or a *visio intellectualis*—in Augustinian terms—was reserved for the prelapsarian man or the glorified man, but not the 'wayfarer' [*viator*] of this life.

So, to seventeenth-century philosophical readers of Descartes—versed as they most likely would have been in Thomas's writings, it would seem that the meditator accesses a form of evident knowledge that would only be available to Adam, or to a human in his glorified state.[78] We may then read Cartesian metaphysics as a new state of conceptual equilibrium between old concepts and the reformed distinctions of self-world, matter-thought, such that it makes possible in *vita præsentia*, a piece of intuitive knowledge that was promised for the *vita altera.* Ultimately, the reader is asked to relinquish a mindset that took the existence of the external world as intuitively evident, but left the immortality of the soul be settled by revelation, and enter another where the self can identify itself with its incorporeal cogitative part but which leaves the existence of anything outside of it uncertain or inconclusive. By making possible the reflexive operation of the mind over its acts prior to and independently of external things [*res extra me posita*], the existence of a world at large would become just another item subject to radical doubt. Consequently, the existence of matter that was admitted as an indemonstrable postulate in premodern

[78] As indicated in his early *Regulæ* X-XI.

times (Ch. I-II), would stand as a demonstrable theorem in the modern (Ch. III.IV).

In George Berkeley's (1685-1753) view, the doctrine of ideas that emerged in the *Discours*, the *Meditationes*, the *Principia*, marked *the ground zero for a specific vector in the history of ideas that led to the kind of absolute idealism he advanced convergently with Arthur Collier.* Entering Chapter IV: Matter and Dream, Berkeley believed that when Descartes challenged the consistency of, say, a mind-independent hotness, or the formal truth of statements like 'the fire is hot,' he set off a process that would not be completed until all ideas had been purged of their material counterpart in the real world. Just as the corpuscularian stage of natural philosophy marked the idealization of sensible qualities, or the rise of occasionalism marked the deification of causal agency, Berkeley will suggest *desubstantiating* all qualities, in confidence that the immaterialist philosopher merely extends against the corpuscularian the same kind of critique the latter had already directed against the scholastic.

According to Berkeley's sketch for a history of its psychogenesis, the doctrine of matter was initially motivated by the intellectual need to suppose a *substratum* for the subsistence of qualities beyond the self, which was for him natural as also relevant to his day. In our attempt to absolve ourselves from the authorship of certain ideas that are inadvertently excited in us—an attitude that is, in and of itself, as natural as it is valid—we look for ontological and causal support in matter, driven by the false presupposition that, *if some object of thought is independent from my will or yours, it must also be independent of all thought whatsoever*; a "stupid, thoughtless *Somewhat*." But where things thinking and things thought exhaust all possible modes of being, reality would differ from an illusion in the way a lucid and coherent dream differs from a confused one (*Dialogues* III, 108; *PHK* §34). The difference between the real and substantial and

the ideal and phantastical becomes a matter of degree of intensity and coherence of sequence. So, the epistemic quest for what had been hitherto framed as the hidden essence of things behind the veil of qualities should rather turn to how these qualities are ordered in experience; the grammar, as it were, of our living conversation with God.

.7 Post Grey

The present project was initially framed along the theme of *Vanishing Matter and the Laws of Motion* (2010) edited by Peter Anstey and Dana Jalobeanu, in conjunction with Jean-Luc Marion's lectures and subsequent conversations on Descartes and general metaphysics in the University of Chicago through: *Descartes on the Self and God, and His Opponents* DVPR 33812 (Spring, 2017); *Historical and Theoretical Limits of the Concept of "Metaphysics"* DVPR 33600 (Spring, 2019) and the *Oberseminar* Jan. 13-22, 2019. In the course of these meetings and seminars there emerged the prospect of accounting for the transformations of the notion of matter from sixteenth-century Renaissance Aristotelianism to early eighteenth century. Throughout this period in intellectual history, there seemed to be an ever-growing tendency to spiritualize, phenomenalize, or relativize properties that were thought to pertain to a world beyond thought.

But as the research went on it became clear that each iteration in this gradual vanishing of matter was embedded in larger œconomies of ideas, axioms, intuitions, that needed to be accounted for. There were incredibly thorough books on the matter like Ernan McMullin edited volume, *The Concept of Matter* (1963) based on the conference of the same name that took place at the University of Notre Dame (September 1961); Thomas A. Holden, *The Architecture of Matter: Galileo to Kant* (2004); Ted M. Schmaltz, *The Metaphysics of the Material World: Suárez, Descartes, Spinoza* (2019) but I was looking to tell the particular story (if that story was even possible) of the transformation of the Aristotelian-Thomist *ὕλη* from medieval realism to the first modern forms of absolute idealism (Berkeley, Collier).

Ted Schmaltz, Roger Ariew, Dennis de Chenes, have all dealt with this problem in their seminal works, more or less tangentially, and provided me with a detailed exposition of all those

problems in natural philosophy and metaphysics that had accumulated for as long as the scholastic method of teaching, of writing, and thinking reigned in Europe. But it was Robert Pasnau's latest book *After Certainty* (2017) that provided the missing key: an important and non-continuous change between a long tradition of making external things the immediate object of the intellect to one that makes the mind's contents, ideas, the immediate object. It is what he calls "the inward turn" beginning with Descartes's doctrine of ideas. This gradual vanishing of matter, it seemed, could somehow be related to this radical shift of the proper object of the intellect.

Finally, in the same way that Jean-Luc Marion's identified in the early *Regulæ* a Descartes who engages in a subtle and silent dialogue with Aristotle towards an *Ontologie grise* grey ontology [to be soon published in English], can the same be claimed—if not so masterly and convicingly as professor Marion has done for *Meditationes*? Did Descartes conceived the *Meditationes* as making a stand against the common-sense-assumptions of the time? And could the new model be a subversion, if not of the Thomist universe, at least of the Thomist motivations behind the impossibility of the *cogito* in this life.

Could the "greying out" of the Aristotelian *οὐσίαι* have been complemented by a re-assertion of the capacities of human cognition which Thomas reserved for the life before the Fall and after Resurrection?

.8 Why Thomas?

At this point it might be *à propos* to motivate the focus on Thomas. Indeed, why let Thomas speak for the pre-modern understanding of Aristotelian matter, when we have views varying across the universities, across the various mendicant orders, or even across thinkers of the same order and the same university over time, leading up to the eclectic work of the sixteenth-century humanist compilers (the Coimbra fathers, Pererius, Toletus, Eustachius, Scipio, Suárez).

Étienne Gilson stated once that Descartes engaged in the "art of putting new wine into old bottles," which means, in the context of his *Index Scholastico-Cartesienne* (1912), that Descartes was using a conceptual framework borrowed from Thomas Aquinas. After all, when Descartes decided to retreat to the Netherlands in '39, he brought a copy of the Bible and the *Summa* from Paris (which could mean either the *Summa Contra Gentiles* or the *Summa Theologiæ,* henceforth *SCG* and *ST*) as communicated to Mersenne in December 25, 1639 (AT II, 630). What is more, when Pomponazzi pointed out the inconsistencies and poor textual support for the doctrine of personal immortality of the soul (1516), he seemed to be referring to the Thomist interpretation of the Aristotelian *anima*, *intellectus*, impassivity etc. as much as Descartes also posed the *Meditationes* (1641) as a valid way out of the unstable synthesis of Thomist Aristotelianism. On the other hand, Roger Ariew has claimed that, *pace* Gilson—and although the study of Thomas did witness a renewed interest in the second half of the sixteenth century—it was after all the Scotists that Descartes was in dialogue with.

For the purposes of the present study, Thomas shows us the conceptual origins and the wider historical circumstances of a core of ideas about matter, cognition and the external world

that persisted through the elaborations and complications of his successors in the University of Paris, Cologne, Oxford and then Salamanca, Coimbra, Padua, Bologna, Pisa and Rome. If we take Fracastoro, Cæsalpino, and Fernel as representative of "applied Aristotelianism," as opposed to scholars as Zabarella, who worked on conceptual matters of Aristotelianism, running through all of them is a middle-of-the-road mainstream form of Aristotelianism, the foundation of which was set in the thirteenth century by Albert Magnus and Thomas Aquinas in the thirteenth century, and achieved its most refined form in the Renaissance era; before it got systematized once again in the *summæ* of the Jesuits of the second half of the sixteenth century. Being situated so early in the history of Latin Aristotelianism, Thomas can tell us more about the implicit theo-epistemic values that gave his adaptation of Aristotle its particular character, than Scotus who, as a Franciscan, deviated from the mainstream interpretation in many chapters of Aristotelian ontology, to wit, the pure potentiality prime matter and unicity of substantial form among others.

Notwithstanding the areas Thomas did not cover (especially elements of mental reality and epistemology that would become very important in the later generations) and despite the fact certain aspects of his writings were targeted by the 1277 condemnations, the Thomist synthesis was still relevant in the educational institutions even three centuries after its inception, as a middle way in the great disputes on the immortality of the soul in Padua. In fact, it remained relevant as late as the 1580s and 1590s, the period when the *Ratio* was being drafted beginning with a committee of twelve Jesuit priests appointed under the generalate of Claudio Aquaviva, in 1581. A letter that contained the manuscript for the 1586 *Ratio*[79] prescribed that Aquinas be followed closely and ordinarily, to the degree that one should not be allowed to teach theology if not well

[79] *Ratio, atq. Institvtio Stvdiorvm Societatis Iesv* (Naples: Targuinius Longus, 1603) as translated in *The Jesuit Ratio Studiorum of 1599*, trans. Allan P. Farrel (Washington D. C.: Conference of Major Superiors of Jesuits, 1970).

disposed, not approve, or take little interest in the teaching of St. Thomas.[80] We read in the final *Ratio, under* the *Rules of the Professor of Scholastic Theology*, that all members "shall expressly follow the teaching of St. Thomas in scholastic theology," to "make every effort to have their student hold him in the highest possible esteem.[81] If a professor needs to commit in one view, as opposed to just reporting opinions of other doctors, let him commit to the views of St. Thomas.[82] Finally a professor of philosophy ought to:

> … always speak favorably of St. Thomas, following him readily when he should, differing from him with respect and a certain reluctance when he finds him less acceptable.[83]

This important document provided a template for Jesuit education to be circulated throughout the Jesuit educational nexus across Europe (and as far as China)[84] for as late as the end of seventeenth century. Among other Jesuit institutions, it also informed the curriculum of René Descartes's *alma mater*, La Flèche. What is more, aside from the explicit directive to follow Thomas, Chapter II goes to show that the *Ratio* was also informed by the mid-sixteenth century disputes on the certainty of mathematics. For the purposes of this study then, the *Ratio*

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[80] "The provincial is to be especially careful that no one be appointed to teach theology who is not well disposed to the teaching of St. Thomas. Those who do not approve of his doctrine or take little interest in it, should not be allowed to teach theology (*Rules of the Provincial*, §2, pp. 2-3)."

[81] Members of our Society shall expressly follow the teaching of St. Thomas in scholastic theology. They should consider him their own teacher and should make every effort to have their students hold him in the highest possible esteem. Still, they are not to consider themselves so restricted to his teaching that they may not depart from him in any single point. Even those who expressly style themselves Thomists sometimes depart from his doctrine. The members of the Society therefore should not be more strictly bound to him than the Thomists themselves (*Rules of the Professor of Scholastic Theology,* §2, pp. 33-34) […]

[82] "It is not enough for him to report the opinions of the doctors without committing himself. Let him either defend the views of St. Thomas, as has been said, or omit the question altogether (*Ibid.* §13, p. 37)."

[83] "Contra vero de Sancto Thoma nunquam non loguatur honorifice: libentius illum animis, quoties oporteat, ſequendo; aut reuerenter, & grauate, ſi quando minus placeat, deferendo" (*Rules of the Professor of Philosophy*, §6, pp. 40-41 in *Ratio Studiorum Societatis Iesv* of 1599, p. 69).

[84] Discussing the diffusion of the original culture of the missionaries into foreign ground which went into the design missionary activity in Chinese ground, Uhalley and Wu note that: "… This background deeply affected the way in which he desitned his missionary activities in China. For instance, the fact that Jesuits in China insisted so much on Aristotelian philosophy can be understood by its place in the *Ratio Studiorum*, the uniform study program for Jesuits" (S. Uhalley and X. Wu, *China and Christianity Burdened Past, Hopeful Future* [UK: Taylor & Francis, 2015], p. 91).

forms a crucial link between the Scholastic spirit of the European educational institutions, or whatever was left of it, and the inception of new ideas in reaction to it, especially Descartes.

> Vaſt Chain of Being! which from *God* began,
> Ethereal Eſſence , Spirit , Subſtance, *Man*,
> Beaſt, Bird, Fiſh, Inſect! [85]

Chapter I, on *Matter, Order, and Cognition*, goes on to show that this predominantly Aristotelian-Thomist (and to some degree Averroist) doctrine of matter that lasted down to the Renaissance, was the product of *a systematic attempt to normalize the perceived shortcomings of human cognition by pairing it with a material world as its proper object*.

The human condition formed a crucial piece in the fulfillment of an order of creation, a *scala naturæ* that ranged from pure potentiality, *prima materia*, to pure activity, the *actus purus*. If such an "amphibious" plane of existence had not been materialized, the world would be incomplete and that would impute a case of cosmic injustice on the part of an all-powerful being. But Thomas is credited with protracting the spirit of the same theodicy into matters epistemological.

> In a world where the measure of knowing power [*vis cognitiva*] was proportional to the measure of perfection, the dignity of the human being was tied to its unique point-of-view: among all substances capable of reason, humans have the unique ability and duty to extract intelligible content out of a world external to themselves. The proper object of that uniquely human form of cognition in *vita praesentia* was material reality. The human mind and the sensible world were in effect made for each other. To seek for forms of knowledge or a source of certainty from a different source than these preestablished points of contact with the external world would be to ask for the impossible.

[85] Alexander Pope, *An Essay on Man* (London: Three Flower-de-luces, 1733), I: p. 14, ll. 237-239.

I.1 Topoi

In the Thomist synthesis, matter assumed the role of a differentiator in all three principal areas of Peripatetic inquiry: metaphysics, theory of sensation and of mind, and the theory of science. What were the original topoi in the Aristotelian corpus that occasioned such an understanding?

A. In regards to metaphysics, matter made possible a *continuum of perfection*—from prime matter, to stone, plants, animals, men, to angels of varying degrees of purity and finally God. It was based on two principles of Aristotle:

A1. *Met.* Zeta 7, 1037 a1:

παντὸς γὰρ ὕλη τις ἔστιν ὃ μὴ ἔστι τί ἦν εἶναι καὶ εἶδος αὐτὸ καθ' αὑτὸ ἀλλὰ τόδε τι	*... et non ſenſibilium materia, & omnis, quod non ē quid erat esse*—Johannes Bessarion's trans. *Aristotelis Opera* (1562), VIII, 1562 190v G. *ergo erit materia etiam quibuſdam rebus non ſenſibilibus, et cuiuslibet, quod non eſt quid eſt per eſſentiam*—William of Moerbeke's versio vulgata ex. Ar. (1562) 191r A.

A2. *Met.* Zeta 7, 1032 a20:

ἅπαντα δὲ τὰ γιγνόμενα ἢ φύσει ἢ τέχνῃ ἔχει ὕλην	*Cuncta vero, quæ aut natura, aut arte fiunt, habent materiam*—Johannes Bessarion's trans. *Aristotelis Opera* (1562), VIII, 171v M. *Et omnia, quæ generantur aut a natura, aut artificio, habent materiam*—Johannes Bessarion's trans. *Aristotelis Opera* (1562), VIII, 172r B-C.

B. By correspondence, matter made possible a continuum of cognitive power[86] [*vis cognitiva* or *cognoscitiva*] from the more material forms of cognition to the less immaterial; from the plant that *perceives* most materially, to animal, the human being, up to the hierarchies of the angels and finally God, who is said to know everything immaterially and through His essence. This is a view couched on the following Aristotelian *loci*:

B1. *De Anima* II.12 424 a17-19:

αἴσθησίς ἐστι τὸ δεκτικὸν τῶν αἰσθητῶν εἰδῶν ἄνευ τῆς ὕλης

Ibid. III.9 432 a1-2.

οὐ γὰρ ὁ λίθος ἐν τῇ ψυχῇ, ἀλλὰ τὸ εἶδος

non enim lapis in anima est, sed species <lapidis>—Aquinas, *ST* Ia 85.A2, co 3; 14.A5, ad 2).

B2. *De Anima* III.4 429 a16-18:

ὥσπερ τὸ αἰσθητικὸν πρὸς τὰ αἰσθητά, οὕτω τὸν νοῦν πρὸς τὰ νοητά ὁμοίως ἔχειν

sicut sensitiuum ad sensibilia, sic intellectum ad intelligibilia—William of Moerbeke's translatio antiqua.

ſimiliter habere, ut ſenſitiuum ad ſenſibilia, ſic intellectum ad intelligibilia—Michaelis Sophianus's trans. (1562) 137r, A:

B3. *De Anima* III.4 429 a20-24:

ὥστε μηδ' αὐτοῦ εἶναι φύσιν μηδεμίαν ἀλλ' ἢ ταύτην, ὅτι δυνατός. ὁ ἄρα καλούμενος τῆς ψυχῆς νοῦς ... οὐθέν ἐστιν ἐνεργείᾳ τῶν ὄντων πρὶν νοεῖν

Quare neque ipsius esse naturam neque unam, set aut hanc quod possibilis. Vocatus itaque anime intellectus (dico autem intellectum quo opinatur et intelligit anima) nichil est actu eorum que sunt ante intelligere—William of Moerbeke's translatio antiqua.

vt nulla ſit eius natura niſi hæc, quòd poſſibilis. Ergo qui vocatur animæ intellectus, uoco autem intellectū quo διανοεῖται & exiſtimat anima, nihil eſt actu eorū quæ ſunt, antequam intelligat—Michaelis Sophianus's trans. (1562) 138v, D.

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[86] (a) across different subjects, from plant that *perceives* most materially, to animal, up to the hierarchies of the angels and finally God; (b) as well as across the faculties encompassed by the same subject of knowledge—from *sensus* proper to *sensus communis*, to *intellectus*. Just as an angel can perceive everything in the world in a more immaterial and unitary way than the one below it, i.e. fewer universal notions, or man for that matter, so too the *sensus communis* affords a more unitary form of knowledge in relation to each *sensus* taken individually but less immaterial than the kind of knowledge the *intellectus* affords.

C. Finally, matter suggested a continuum of ascending certainty (*ἀκριβολογία*) and dignity among the scientific disiplines, based on the following:

C1. *Met*. a.3, 995 a14-17:

τὴν δ' ἀκριβολογίαν τὴν μαθηματικὴν οὐκ ἐν ἅπασιν ἀπαιτητέον, ἀλλ' ἐν τοῖς μὴ ἔχουσιν ὕλην. διόπερ οὐ φυσικὸς ὁ τρόπος· ἅπασα γὰρ ἴσως ἡ φύσις ἔχει ὕλην.

Certitudinem vero sermonis mathematicam non oportet in cunctis quaerere, sed in his, quæ non habent materiam. Quare non est naturalis modus. tota enim natura forte habet materiam—Johannes Bessarion trans. *ex Græc.* in *Aristotelis Opera* (1552), VIII, fol. 17r B.

C2. *APo* I.27 87 a31-33:

Ἀκριβεστέρα δ' ἐπιστήμη ἐπιστήμης καὶ προτέρα ... ἡ μὴ καθ' ὑποκειμένου τῆς καθ' ὑποκειμένου.

C3. *De Anima* III.4, 430 a3-4:

ἐπὶ μὲν γὰρ τῶν ἄνευ ὕλης τὸ αὐτό ἐστι τὸ νοοῦν καὶ τὸ νοούμενον

In hiis quidē enim quæ ſunt ſine materia, idem eſt intelligens et quod intelligitur—William of Moerbeke's trans. *ex Græc*. (1562) 159v F.

Et eſt etiam intellectum, ſicut intellecta. Formare enim per intellectum, & formatum per intellectum, quæ ſunt extra materiā, idem ſunt —Michaelis Sophianus's trans. (1562) 159v F.

I.2 Matter, Being, Simplicity

Aquinas often takes as evident that the universe displays an order.[87] Such a view would be attested empirically through the continuity of function and structure in organic life, or it would be argued *a priori* as a necessary feature of a world that had presumably been created perfect. In both Greek and Latin, the notion of 'perfection' is related to the action of 'accomplishing' something or 'rendering it complete' (*τελέω*, *perficio*). Similarly, the universe would not have been made perfect, i.e. complete, had it not been laid out along various degrees of perfection,[88] the passage between any two degrees of which requires an intermediate one [*dicendum quod de extremo ad extremum non pervenitur nisi per medium*, (Q55, A2, ad 2)]. The idea of a *scala naturæ*, or *Chain of Being*, that uninterrupted cascade of existence that encompassed all possible grades of descending perfection, goes back to Greek and Roman antiquity. Arguably, it had such a lasting impact through the ages that made an ideal first case study in that larger research program that Arthur O. Lovejoy's launched as a natural history of what he called unit-ideas.[89]

It was clearly stated in the *Metaphysica* Zeta that a thing contains matter to the degree it is not identical to its essence.[90] By the end of that book, all that which was found intelligible of a substance was delegated to form, and everything else was relegated to matter. In contrast to Descartes's meditator who could affirm a being consisted *entirely* in what we affirm of it in all

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[87] That is: an *ordo rerum* (*ST* Ia Q57.A3, co 2)] and a principle of continuity [*dicendum quod de extremo ad extremum non pervenitur nisi per medium*, (Q55, A2, ad 2)]. Latin text based on the Leonine Edition, transcribed and revised by The Aquinas Institute, March 20, 2022, https://aquinas.cc/la/en/~ST.I.

[88] [… *in materia considerantur diversi gradus perfectionis* (76.A4, ad 3); *Hoc autem perfectio universi exigebat, ut diversi gradus in rebus essent.* (89.A1, co 3); … *ipsa universi perfectio et multitudinem et diversitatem rerum requirat* (*QDePot* Q3.A16, c. 2); *completio universi* (*QdePot*. Q5.A9, co)].

[89] Arthur O. Lovejoy, *The Great Chain of Being: a Study of the History of an Idea. The William James Lectures delivered at Harvard University, 1933.* (Cambridge: Harvard U. Press, 1936).

[90] *παντὸς γὰρ ὕλη τις ἔστιν ὃ μὴ ἔστι τί ἦν εἶναι καὶ εἶδος αὐτὸ καθ' αὑτὸ ἀλλὰ τόδε τι* (*Met*. Z.11 1037a); *ὅσα δὲ ὡς ὕλη ἢ ὡς συνειλημμένα τῇ ὕλῃ, οὐ ταὐτό, οὐδ' κατὰ συμβεβηκὸς ἕν* (*Met*. Z 1037 b4-6); Also 1035b ff.

certainty—thinking [*cogitatio*] of the soul, or extension [*extensio*] of the body—it was simply *not expected for natural beings such as ourselves to consist entirely in what we are*. In fact, the central question that motivates the study of being *qua* being through the book *Zeta*, *what is being?* [*τί τὸ ὄν*; *τί δὲ χρὴ λέγειν καὶ ὁποῖόν τι τὴν οὐσία;*] is meaningful only to the degree that the units of Being we begin with, being such as a dog, a horse, or Socrates, do not entirely consist in what they are. For how could the substance *of* Socrates [*τί οὐσία αὐτοῦ;*], the *what it is* to be Socrates, be meaningfully inquired into if the historical philosopher was identical to his essence? Aristotle assumes, for better or for worse, there must be something *more* involved in the concrete self of Socrates that makes him *less* than his essence. In a theory of Being according to which its units [*οὐσίαι*] are said to consist in what they were to be [*τί ἦν εἶναι*], matter [*ὕλη*] is all that which prevents composite beings from fully embodying their nature. These three terms make it possible to claim, in a non-tautologous way, that Socrates *consists in* his soul, even though he is *not identical* to it. In this picture then materiality becomes a measure of self-alienation; a sort of 'ontogical noise' that accompanies subsistence at any given place and time that prevents one from being what they really are. Or, at least this is arguably the reading of Aristotle's words that involves the fewest assumptions.

Now by the principle that states the existence of a thing found imperfect implies the pre-

existence of a perfect thing,[91] and the association of simplicity with perfection, Thomas could argue that a composite being logically presuppose an absolutely simple thing. But even more than just logically entailed by the composite, an absolutely simple thing is also presupposed as its cause.[92] Its preeminent simplicity would mark the absolute identity of an essence and the act of existence, of *esse* and *quod est*. Now, by the contrapositive of the abovementioned statement, a thing that is identical to its essence must be exempt of matter. So, ultimately, the most perfect being is also the most simple; it is an *actus purus* and *there is no matter standing in the way of completely subsisting in what it is*.

Scaling down from this unique *actus purus*, every creature is allocated a level by so much the lower in a ladder of perfection, by how much more potency they admit in their composition. But all creatures, be them corporeal or incorporeal, are composite insofar as they have been created.[93] This is basically Aristotle's view that all things are generated out of some preexisting *sub-*

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[91] "… [I]n quocumque autem genere invenitur aliquid imperfectum, oportet praeexistere aliquid perfectum in genere illo" (Q51.A1, co). In fact, it is the gradation attested in the world that allows him to mount the fourth argument for the existence of God in the *Summa*, Ia Q2.A3, c. 15: to say a thing is hotter than another presupposes a preeminently hot thing against which all other hot things assume their relative degrees of hotness. For the same reason, seeing that beings differ in goodness, truth and nobility by the more or less, there must be a thing most good [*optimum*], most true [*verissimum*], most noble [*nobilissimum*]; and since the summit of truth and the summit being meet at the same point (*Met.* a), there must be some preeminently existing thing that is the cause of them all. But by Q3.A2, c. 4, since every agent acts by its form, what is essentially an agent [*primo et per se agens*] must be essentially a form [*primo et per se forma*]. Also cf. Ficino's *Quæstiones quinque de mente*: "Qui enim totus ipsum in ſua forma videt eiusque terminos atque gradus per quos propagatur vndique proſpicit absque dubio poteſt ſingula quæ illis terminis compræhenduntur: media compræhendere. Mitto nunc quod cum apud Platonicos ſuper ens atque ſub ente queat ipſum vnum bonumque excogitare: multo magis totam eius latitudinem vndique percurrere poterit. Certe poſt notionem entis quod vocabulum ſæpius iam repetimus etiam quod ab eo diuerſiſſimus fingi poteſt: ideſt non ens pro arbitrio cogitat. Si poteſt ab illo ad hoc infinite inde diſtans percurrere multomagis: p<oteſt> quelibet q<uæ> ſub illo media contententur. Hinc Ariſtoteles inquit. Sicut materia quæ vltimum e naturalium omnes potest corporeas induere formas: omniaque hoc pacto corpalia fieri ſic intellectum qui vt ita loquar ſupernaturalium vltimum eſt ſuppremumque naturalium spirituales omnes rerum omnium formas accipere poſſe …" (*Epistolæ Marsilii Ficini Florentini*, [Nuremberg: Antonium Koberger, 1494-5], fol. XLVIIIv).

[92] "[N]ecesse est ut omnia composita et participantia, reducantur in ea, quæ sunt per essentiam, sicut in causas. Omnia autem corporalia sunt entia in actu, inquantum participant aliquas formas. Unde necesse est substantiam separatam, quæ est forma per suam essentiam, corporalis substantiæ principium esse" [Aquinas, *Comm*. Lib II of *Analytica Post*. Lectio 2, 296].

[93] "… in quantum potentialitas incepit admisceri actui, in quantum esse recipiens ab alio non est suum esse, sed quodammodo potentia ad illud" (*QDePot*. Q3.A16, c. 3).

stratum[94] drawn to cosmological proportions. While Aristotle applied the model of the artificer to all things generable by nature or by human art in the sublunary realm, Thomas will extend the principle of composition to all forms of created existence: terrestrial and celestial; eternal or temporal; spiritual and corporeal. Thomas could introduce a hierarchy of angels according to their proximity to the *actus purus* as an alternative to the universal hylomorphism of Ibn Gebirol and of St. Bonaventure later on, the downside being one also needed to assume one angel differs from another as one species differs from another, a thesis that was to be condemned in 1277.[95]

Now if spiritual things like angels and celestial bodies are no less subject to creation than matter-bound things like humans and plants,[96] they must all lay latent in a *hypokeimenon*, in some way or another. Since, being exempt of matter, they cannot preexist in the potentiality of matter, these simple creatures can only preexist in the mind of God. This is how Thomas harmonized the pagan conception of God as an impassive mind sentenced by its very perfection to eternal self-contemplation, to the Christian God whose providence extends as far and as wide as everything created and sustained by Him.

Take the following analogy. The mind of the student is awakened to the existence of certain geometric configurations as the subjects of many demonstrable properties. But before the

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[94] *ἐν παντὶ τῷ γεννωμένῳ ὕλη ἔνεστι* (*Met*. Zeta 8 1033b); *ἅπαντα δὲ τὰ γιγνόμενα ἢ φύσει ἢ τέχνῃ ἔχει ὕλην· δυνατὸν γὰρ καὶ εἶναι καὶ μὴ εἶναι ἕκαστον αὐτῶν, τοῦτο δ' ἐστὶν ἡ ἐν ἑκάστῳ ὕλη* (Zeta 7, 1032a 20); *οὐδὲ παντὸς ὕλη ἔστιν ἀλλ' ὅσων γένεσις ἔστι καὶ μεταβολὴ εἰς ἄλληλα* (Met. Eta 5 1044b).

[95] So we read in condemned thesis 42A that: "God cannot multiply individuals of the same species without matter." And, 43A that: "God could not make several intelligences of the same species because intelligences do not have matter" (Étienne Tempier, "Selections from the Condemnation of 1277" in *Blackwell Readings in Medieval Philosophy*, ed. Gyula Klima, Part 2. *Philosophy of Nature, Philosophy of the Soul, Metaphysics* [MA; Oxford; Carlton: Blackwell Pub., 2007], p.183).

[96] "Unde solus Deus, qui est ipsum suum esse, est actus purus et infinitus. In substantiis vero intellectualibus est compositio ex actu et potentia; non quidem ex materia et forma, sed ex forma et esse participato" (Q75.A5, ad 4); "[Chapter title:] *Quod in substantiis intellectualibus creatis differt esse et quod est* (*SCG* II, 52);" "[N]ihil est eis causa, sed ipsa sunt causa essendi aliis. Et per hoc transcendunt in veritate et entitate corpora caelestia: quæ etsi sint incorruptibilia, tamen habent causam non solum quantum ad suum moveri, ut quidam opinati sunt, sed etiam quantum ad suum esse, ut hic philosophus expresse dicit" (Aquinas, *Comm. Lib II of Analytica Post*. Lectio 2, 295).

essence of a circle makes an impression in the student's passive intellect, it is contained in the mind of the teacher as a potentially teachable subject. Potencies cannot exist *in vacuo*. They either inhere in a physical or a mental *substratum*. Upon the obtainment of the right efficient circumstances, circles may take on a corporeal dimension, to wit, be drawn in graphite, or have their *logoi* or *rationes* be spelled out in visible and auditory signs in their way of informing the mind of the student. In themselves however, these natures contain the mere possibility of existence in that they are not marred by some inner contradiction, such as a square circle would be. After all, this is why there can be no ontological argument for the existence of any finite thing: the idea of a circle in itself is not rich enough to also encompass the efficient conditions of its construction *hunc et nunc*; the motions of the hand enacting it in this-or-that matter, or the entire knowledge it imparts anew to a student are not included in its nature.

But even within the order of created things themselves, there can be distinguished further levels of composition in proportion to their immateriality, as we go down the ladder of perfection: while the *substantiæ intelligibiles* are created as incorporeal forms *immediately* [*per creationem producuntur in esse*][97] out of the eternal mind they pre-occupy; there are also corporeal forms, like the human soul, which, in addition to being conceivable by the divine mind, rely on some physical stuff to acquire a body specifically articulated for discharging the necessary functions of embodied life [*ex praeiacenti materia factae*].[98] The lives of these corporeal forms trace unique trajectories into prime matter, made up by all those places and times transversed by the individual. These are not some preconceived *eidē* made real like the simple forms are [called

[97] "… [L]icet creaturæ aliæ sint angelo inferiores, tamen earum productio requirit infinitam virtutem producentis, in quantum per creationem producuntur in esse, utpote non ex praeiacenti materia factae. Et ideo omnes creaturae, quæ non sunt factæ ex praeiacenti materia, oportet dicere immediate a Deo esse creatas (*QdePot*. Q3.A16, ad 20)."

[98] *ibid.*

πρῶται οὐσίαι in *Met.* Zeta]; they are the *ἐντελέχειαι*, *structurally fated by their unique mode of subsistence to be the acts of bodies*.

So the Aristotelian composition of form and matter was interpreted by Thomas in two ways [*duplex compositio*] along Boethian lines, or applied to creation by two iterations,: more strictly as *forma* and its physical *materia*; less strictly as the "what it is" [*quod est*] and "that by which it is" [*quo est*]. He tells us that the *quod est* is the subsistent form while the *quo est* or *esse* is related to that form as the running is related to a runner [*quod est* est ipsa forma subsistens, sicut cursus est quo currens currit (Q50.A2, ad 3)][99]. Presumably, there is a man that can potentially run but it is by the act of running we say he actually runs. This captures the view that existence is accidental to all creatures (incorporeal or corporeal) just as running is accidental to man and need to be imparted or enacted. To that degree, a running man is a composite of a *quod est* and of an *esse.* Perhaps we may also say that God for Thomas is pure running, and it is only by participating in that form of activity, running, that a running man comes to be.

[99] There are two orders of composition in the created things: "Prima quidem formæ et materiae, ex quibus constituitur natura aliqua. Natura autem sic composita non est suum esse, sed esse est actus eius. Unde ipsa natura comparatur ad suum esse sicut potentia ad actum. Subtracta ergo materia, et posito quod ipsa forma subsistat non in materia, adhuc remanet comparatio formæ ad ipsum esse ut potentiæ ad actum. Et talis compositio intelligenda est in angelo. Et hoc est quod a quibusdam dicitur, quod angelus est compositus ex *quo est et quod est*, *vel ex esse et quod est*, ut Boetius dicit, nam *quod est* est ipsa forma subsistens, sicut cursus est quo currens currit. Sed in Deo non est aliud esse et quod est, ut supra ostensum est. Unde solus Deus est actus purus" (Q50.A2, ad 3).

I.3 Matter, Power and Cognition

In parallel to the cascading gradient of being or simplicity there is a cascading gradient of corresponding powers [*virtus*] or operations. After all, such correspondence is only anticipated in a philosophical system that understands existence (*esse*) as activity (*energeia*): everything that exists is active, to some degree or another. And by the recurrent principle that "everything exists as it acts," or that *operatio sequatur esse*,[100] which still remained relevant as late as the Renaissance, the manner something exists is reflected in and illuminated by the manner it operates.

In most general terms, the higher a *thing* is situated in the order of Thomas's universe the more integrated and extensive its power [*quanto aliquid est superius, tanto habeat virtutem magis unitam et ad plura se extendentem* (Q57.A2, co 3)]; In similar terms, a *forma* is more noble according as its *operatio* or their *virtus* exceeds the *materia corporalis* and is less dominated by it (Q76.A1, co 12; cf. Q78.A1). So the form of a mixed body, this flame for example, has an operation that extends beyond the elemental qualities [*forma mixti corporis habet aliquam operationem quæ non causatur ex qualitatibus elementaribus* (Q76.A1, co 12)]. Beyond these inorganic mixtures that can only be moved by principles that remain extrinsic to them, the first and most simple souls that are moved by a principle that is now intrinsic to them (Q78.A2, co 1, 2), namely their *physis* defined in the second book of the *Physica* as *ὁρμὴ μεταβολῆς ἔμφυτος* [*impetus mutationis innatus*].[101]

Similarly, the order of animate existence admits various degrees of relative perfection

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[100] *dans eis esse et virtutem et operationem* (Q8.A2, c. 1); *per se agere convenit per se existenti* (Q75.A2, arg 2); *similiter enim unumquodque habet esse et operationem*, (Q75.A3, co1)]; *eo modo aliquid operatur quo est* (Q75.A2, co2); *natura autem et virtus animæ deprehenditur ex eius operatione* (Q70.A3, c. 1); Pomponazzi references it as the common notion that: *operatio ſequatur eſſe* (*De Immortalitate*, IV, p. 12)".

[101] [*impetus mutationis innatus*, or: *principium alicuius et causa movendi et quiescendi in quo est primum per se et non secundum accidens* (*Physica* II, 1. 192 b16-20, trans. nova, by William of Moerbeke)].

internally, by how much more a soul exceeds the limits of corporeal nature in its operation and to the degree the less it takes place by virtue of corporeal qualities [*virtute corporeæ qualitatis*]. Operations like digestion of the vegetative soul are conducted instrumentally by the quality of heat, but though sensation does require corporeal qualities to be performed Thomas notes it does not take place *in virtue of* them, but merely in the manner of the disposition of the organ (*μεσότης*). And though a vegetative soul extends only as far as the body it enlivens, sensitive souls reach out to other bodies by their sensitive powers. Finally, intellective souls can reach out to any being—be it corporeal or incorporeal—the subject matter of metaphysics proper. In that way, there are five kinds of soul-powers [*quinque genera potentiarum*], namely vegetative, sensitive, appetitive, motive and intellective, that are combined into four orders of life [*modi viventium*], i.e. natural kinds: *plantæ*, *conchilia*, *animalia*, *homines* (Q78.A1, c. 4).

Within the soul itself now, the faculties of the *anima sensitiva* are also internally ordered based on the way each receives its proper quality, in particular: a sense is more perfect to the degree (I) it can receive a sensible quality without any concomitant physical alteration in the organ [*immutatione naturali et organi et obiecti* (Q78.A3, c. 3-6)]; (II) the less it is exercised through a medium united to it [*per medium coniunctum fieri* (Q78.A4, c. 6)].

(I) A quality exists *naturaliter* in an organ of sense when it makes it such-and-such [*immutatio naturalis; secundum esse naturale*].[102] This is the only way a sensible species of heat can be received by the humble nutritive soul of the plant for example. But physical or natural changes may also attend acts of sensation of higher-order souls. For example, the heat an animal

[102] Cf. *SCG* II. 50.6 where there is a distinction between a form's perfect and imperfect existence in matter, according as it makes something be such: "*Forma autem perfecte in materia existens facit esse actu tale, scilicet vel ignem, vel coloratum: si autem non faciat aliquid esse tale, est imperfecte in illo, sicut forma coloris in aere ut in deferente.*"

senses by touch also happens to warm their organs of touch. But a smell does not seem to make a nose smelly, any more than the colors in objects seem to color the pupil; such forms were said to exist *spiritualiter* [*immutatio spiritualis; secundum esse spirituale*][103] in the organs because they are not attended by any physical change. On that basis a quality may exist either naturally or spiritually or both in a sense organ.

(II) Accordingly, the organs of touch and taste that have their *media* naturally attached to them—following Aristotle, the skin was perceived to be the medium of transmission between the object and the particular sense, not the organ itself—and they require a physical alteration of the organ, whereas hearing and smell apparently did not. Sight crowns the senses by its ability to be affected spiritually, without any physical alteration of the organ, while also not having the medium (air or water) united to it. On that account it is declared maximally spiritual [*maxime spiritualis*], most perfect of the senses and most universal.[104] Common sense exceeds the proper senses in being more united and far-reaching (Q57.A2, c. 3). In unifying the impressions of the external senses, the center of common sense 'knows' [*cognoscere*] just as much as each of these senses 'knows' and even more, such as the difference between white and sweet in milk.

By the time these qualities make a lasting impression to the imagination and stored into memory, we have to suppose they have all assumed spiritual being. The power of imagination consists in forming an image or an intention *in absentia* not only of the original matter [*aliquod*

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[103] Cf. *SCG* II. 50.6 where there is a distinction between a form's perfect and imperfect existence in matter, according as it makes something be such: "*Forma autem perfecte in materia existens facit esse actu tale, scilicet vel ignem, vel coloratum: si autem non faciat aliquid esse tale, est imperfecte in illo, sicut forma coloris in aere ut in deferente.*"

[104] "Visus autem, quia est absque immutatione naturali et organi et obiecti, est maxime spiritualis, et perfectior inter omnes sensus, et communior" (Q78.A3, c. 6).

idolum rei absentis][105] but of any physical change as well. For even if the heat I felt earlier actually heated my skin, or the burnt taste actually changed the taste of my saliva, recalling that initial fire or dreaming about it does not warm or illuminate the seat of imagination—localized in the anterior ventricle of the brain in the cephalocentric theory of the soul—anymore than it warms or illuminates any of the sense organs it was originally impressed onto.

Lest we admit inanimate bodies feel just as much as animate bodies do, the spiritual mode of existence must be built into the notion of sensitivity or the *vis sensitiva*. But it is important to note here that the distinction spiritual-natural does not line up with the animate-corporeal distinction, much less with that of matter-mind.[106] For qualities such as color may assume spiritual being across the illuminated medium [*διαφανές*] as a matter of natural fact, i.e. covering the distance between object and sense-organ without actually painting the air or the water so-and-so. (We have to assume that volumetric and ambient lighting was not that well attested in collective experience by that time). So though the 'spiritualization' of a sensible species is a necessary stage in the act of sensing, it is not an exclusive feature of the contents of sensitive souls. The species of color is said to exist spiritually in the medium prior to being actually seen. Forms may exist *spiritualiter* even in inanimate *substrata.*

It is important to note that knowing [*cognitio*] is so broadly understood by Aquinas that covers all sorts of impressions made, with the minimal condition being not taking place merely *virtute qualitatis* like the extrinsic heating of a plant, or the internal heating in digestion, by

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[105] "Alia operatio est formatio, secundum quod vis imaginativa format sibi aliquod idolum rei absentis, vel etiam nunquam visae" (Q85.A2, ad 3).

[106] An excellent treatment of these distictions can be found in Robert Pasnau's doctoral thesis (Cornel University, 1994), also printed as Robert Pasnau, *Theories of Cognition in the Later Middle Ages* (Cambridge UK; New York, USA, Cambridge University Press: 1997)

which qualities the organ is disposed in a particular way [*solum ad debitam dispositionem organi*].[107] The *loci classici* for this theory of sensation are the following:

C4. *De Anima* II 424 a18-19; 23-28; 32-; 424 b3:

… αἴσθησίς ἐστι τὸ δεκτικὸν τῶν αἰσθητῶν εἰδῶν ἄνευ τῆς ὕλης, οἷον ὁ κηρὸς τοῦ δακτυλίου ἄνευ τοῦ σιδήρου καὶ τοῦ χρυσοῦ δέχεται τὸ σημεῖον, … ἀλλ' οὐχ ᾗ ἕκαστον ἐκείνων λέγεται, ἀλλ' ᾗ τοιονδί, καὶ κατὰ τὸν λόγον. αἰσθητήριον δὲ πρῶτον ἐν ᾧ ἡ τοιαύτη δύναμις. ἔστι μὲν οὖν ταὐτόν, τὸ δ' εἶναι ἕτερον· μέγεθος μὲν γὰρ ἄν τι εἴη τὸ αἰσθανόμενον, οὐ μὴν τό γε αἰσθητικῷ εἶναι οὐδ' ἡ αἴσθησις μέγεθός ἐστιν, ἀλλὰ λόγος τις καὶ δύναμις ἐκείνου. … καὶ διὰ τί ποτε τὰ φυτὰ οὐκ αἰσθάνεται, ἔχοντά τι μόριον ψυχικὸν καὶ πάσχοντά τι ὑπὸ τῶν ἁπτῶν (καὶ γὰρ ψύχεται καὶ θερμαίνεται)· αἴτιον γὰρ τὸ μὴ ἔχειν μεσότητα, μηδὲ τοιαύτην ἀρχὴν οἵαν τὰ εἴδη δέχεσθαι τῶν αἰσθητῶν, ἀλλὰ πάσχειν μετὰ τῆς ὕλης.

… sensus quidem est susceptivus specierum sine materia, ut cera anuli sine ferro et auro recipit signum … set non in quantum unumquodque illorum dicitur, set in quantum huiusmodi et secundum rationem. Sensitiuum autem primum est in quo huiusmodi potencia. Est quidem igitur idem, set esse alterum est. Magnitudo quidem enim quedam erit quod sensum patitur, non tamen sensitiuo esse neque sensus magnitudo est, set ratio quedam et potencia illius … Et propter quid plante non senciunt, habentes quandam partem animalem et pacientes a tangibilibus (et namque frigescunt et calescunt); causa enim non habere medietatem, neque huiusmodi principium possibile recipere species sensibilium, set pati cum materia.

—William of Moerbeke's *translatio noua* at the behest of Thomas

… verum non quatenus vnumquodque illorum dicitur, ſed quatenus eiuſmodi eſt, & ex ratione. Id vero eſt prium ſenſorium, in quo eiuſmodi potentia eſt. ſunt ergo idem, eſſe vero diuerſum eſt: magnitudo enim quædam fuerit id quod ſentit: non tamen ſenſitiuo eſſe, neque ſenſus eſt magnitudo: ſed ra tio quædam & potentia illius … Conſtat etiam cur plantæ non ſentiant, cum tamen habeant quandam partem animæ, atque à tactilibus aliquid patiantur, quippe quæ & frigeſcant, & caleſcant: cauſa huius eſt, quia non habent mediocritatem, neque eiuſmodi principium, quod ſit idoneum ad recipiendas ſpecies ſenſibilium, ſed patiuntur cum materia.

—Michaelis Sophianus's trans. 1562.

[107] Q78.A2, co 1, 2.

Drawing on Aristotle's crucial analogy between the intelligible and the sensible (**B2**) Thomas *cognitio* is a genus term that is further divided into *intellectiva* and *sensitiva.*[108] What all forms of cognition share in, even the lower ones, is the ability to perceive immaterially to a greater or lesser extent, insofar as they receive some likeness that stands for an external object [*λόγος τις καὶ δύναμις ἐκείνου*] and not be merely be affected by their matter [*μετὰ τῆς ὕλης, cum materia*]. Since a soul perceiving a stone does not become that stone but such-and-such [*non in quantum unumquodque illorum dicitur, set in quantum huiusmodi et secundum rationem*] sensation must rely on its power to become the stone but without assuming its being [*Est quidem igitur idem, set esse alterum est* (*De Anima* II 424a) cited above]. The presence of a *medietas* or *mediocritas* in sensitive souls, such that it can be offset by certain values of external motionsexplains why they operate within a threshold of intensity: an excessive motion of a sensible object can corrupt the sense organ, just as the undue force applied on a string instrument will compromise its harmony. Conversely, the absense of a *medietas* in purely nutritive souls like plants explains why they do not sense, but are merely materially affected.

So with the minimal condition for cognitive behavior set as the ability of a substance to contain formally other forms than its own, [109]Thomas can say that 'sight knows colors,' or 'touch knows warm.' Defined so broadly, *cognitio* becomes a special form of amplification or extension in an overall universe whose beings, cognitive or not, occupy a higher position in the chain of perfection to the degree they extend themselves to more things and restrict themselves less to

[108] *Comm*. *De Anima* III, chapter III, Lectio 4, 622.

[109] "[N]on cognoscentia nihil habent nisi formam suam tantum; sed cognoscens natum est habere formam etiam rei alterius" (Q14.A1, co.)

their corporeal underpinnings.[110]

So to what degree is the abstracting of matter restricted to sensitive or, even more strictly, intellective souls? The function of knowing always involves some minimal matter-removing, and the knower knows only to the degree it can abstract the matter from its environment. But given the aforementioned assumptions, the first stage of abstraction would actually be a physical affair. It would have to happen extramentally, in the ambient *medium* that carries qualities across from object to perceiver. When a substance (fire) interacts with its environment (air) as part of one of its acts (heating) and transmits a species (heat) into its immediate environment it undergoes a kind of abstraction *extra animam*, prior even to being assimilated by any sense-organs.

In the next stage, a corporeal sense-organ receives an *intentio qualitatis* or a sensible species, either spiritually, naturally, or both. Next, the species received from each proper sense coalesce into the *sensus communis*. Imagination being an even higher and more integrated cognitive faculty, it works with the afterimages of the original qualities picked up by the senses minus the physical change registered in the sense-organs upon first encounter. Finally the active part of the intellect facilitates the projection of intelligible species onto the passive intellect, as the product of abstraction from multiple phantasms consolidated in experience.

[110] Q57.A2, co 3; Q76.A1, co 7).

I.4 Immateriality as Indeterminacy

So far we have seen the sum of all creation ordered from the less perfect to the more in proportion to how much the more their operation exceeds corporeal nature. Nested within, there is the sum of all souls according to their *virtus cognoscitiva*. Cognition is minimally defined as *habere formam etiam rei alterius* (Ia Q14.A1, c. 1) and sensation in particular as *suscipere specierum sine materia* (*De Anima*, 424a17, in the translatio nova). So something is more cognitively powerful to the degree it can be impressed with forms without their matter. And it is shown that the form-receiving function of cognition is *more faithful* to the degree the cognitive power is less determinate.

The move from cognitive virtue to the matter-consistency of the receiver is facilitated by an axiom we find many times over across Thomas's writings *receptum est in recipiente secundum modum recipientis*[111] and which he borrowed from Avicenna's *Metaphysics of Healing* V.1-2.[112] Whence, Aquinas infers that the relative *immaterialitas* is the very reason something can be *cognoscens*, and the mode of knowledge is according to the mode of immateriality and the more *a materia separatus & immixtus* is a sense organ, or a faculty, the more *cognoscitiva* it can be;[113] and in most general terms the *ratio cognitionis* is inversely proportional to materiality.[114] If

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[111] "… [O]mne quod recipitur in aliquo, recipitur in eo per modum recipientis (Q75.A5, co 2);" "… receptum est in recipiente secundum modum recipientis (Q76.A1, obj3, Q76.A2, ad 3& ob. 3); " "[q]uod enim recipitur in aliquo, recipitur in eo secundum modum recipientis (Q79.A6, c. 3); "… omne quod recipitur in aliquo, determinatur in eo secundum modum recipientis (Q89.A4, c. 1)." And insofar as operations are concerned: "[o]peratio enim cuiuslibet rei est secundum modum substantiæ eius (Q.50.A2, co 2.)." Cf. Q57.A2, co 2; Q84.A1, co 5);

[112] Avicenna, *The Metaphysics of Healin*g, trans. Michael E. Marmura (Provo, UT: Brigham Young University Press, 2005), pp. 148-162..

[113] "[I]mmaterialitas alicuius rei est ratio quod sit cognoscitiva; et secundum modum immaterialitatis est modus cognitionis]; the more a materia separatus & immixtus a sense organ, or a faculty, the more cognoscitiva it can be" (Q14.A1, c. 1)]

[114] "[M]anifestum est quod *ratio cognitionis* ex opposito se habet ad rationem materialitatis (Q84.A2, c. 2-4)," my emphasis.

indeed intellection and sensation falls equally under a genus of cognition, the intellect should relate to its objects as sense relates to its own objects, as we saw in *De Anima* III.4 429 a16-18. So just as an intelligible object is actually understood by having its matter removed,[115] it is through its immateriality that a created intelligent substance has the power of understanding [*vis ad intelligendum*].[116] In other words, the degree to which something can be gleaned from matter, relates to how much matter a given receiver is ingrained with.[117]

If cognition in general was framed as a matter-removing process in the model of the seal on the wax, it is now claimed that the form-receiving aspect of cognition is more faithful to the degree that the knowing power is less determinate. After all, the impression of the seal is reliable in inverse proportion to the degree that stuff interpolates its own nature into the impression. This view is drawn from some very old artifactual intuitions going back to the pre-Socratics where we find related the *success of the imprinting to the indeterminacy of the receptacle.* Anaxagoras is credited with such a view,[118] while Plato used the example of the mold and the base of the perfume-maker in the overall *εἰκὼς λόγος* of the *Timæus*: just as a mold is more accurate to the degree it lacks any features of its own, or the odors in a perfume more properly mixed to the degree the liquid that acts as a substrate is odorless; if the ideal world is to be variously incarnated in the physical world as faithfully as possible, the receptacle needs to be featureless.

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[115] "[P]er hoc enim aliquid est intellectum in actu, quod est sine materia" (Q87, A1, ad 3).

[116] Q79.A1, ad 4.

[117] It was [1] with this principle, and [2] from the impossibility of apprehending individual forms as such, that he was able to deduce [4] the immateriality of the intellect (Q50.A2, co 2), or, alternatively deduce the incorporeality of the principle of intellection from the possibility of knowing all corporeal beings (Q75.A2, co 1); For, by *modus tollens*, [3] the compositeness of the intellectual soul would imply knowledge only of the singular, because forms would be received only materially and individually (Q75.A5, co 2, Q76.A1, ob. 3 & ad 3; Q76.A2, ad 4).

[118] *ἀνάγκη ἄρα, ἐπεὶ πάντα νοεῖ, ἀμιγῆ εἶναι, ὥσπερ φησὶν Ἀναξαγόρας, ἵνα κρατῇ* (*De Anima* III.4 429 a18-19)

C5: *De Anima* III.4, 429 a20-25:

παρεμφαινόμενον γὰρ κωλύει τὸ ἀλλότριον καὶ ἀντιφράττει ὥστε μηδ' αὐτοῦ εἶναι φύσιν μηδεμίαν ἀλλ' ἢ ταύτην, ὅτι δυνατός. ὁ ἄρα καλούμενος τῆς ψυχῆς νοῦς (λέγω δὲ νοῦν ᾧ διανοεῖται καὶ ὑπολαμβάνει ἡ ψυχή) οὐθέν ἐστιν ἐνεργείᾳ τῶν ὄντων πρὶν νοεῖν· διὸ οὐδὲ μεμῖχθαι εὔλογον αὐτὸν τῷ σώματι.

Intus apparens enim prohibebit extraneum et obstruet. Quare neque ipsius esse naturam neque unam, set aut hanc quod possibilis. Vocatus itaque anime intellectus (dico autem intellectum quo opinatur et intelligit anima) nichil est actu eorum que sunt ante intelligere. Vnde neque misceri est rationabile ipsum corpori.

—William of Moerbeke's translatio noua.

Neceſſe igitur eſt cum omnia intelligat, non mixtum eſſe, vt ait Anaxagoras, vt dominetur ſiue ſuperet, ideſt, vt cognoſcat: nam ſpecies ſe offerens impedimento eſt alieno & obſepit. [138v, Da] *Ita vt nulla ſit eius natura niſi hæc, quòd poſſibilis. Ergo qui voca tur animæ intellectus, uoco autem intellectū quo διανοεῖται & exi ſtimat anima, nihil eſt actu eorū quæ ſunt, antequam intelligat.*

—Michaelis Sophianos's translatio (1562), 137v, D.

C6. *Timæus* 50d-50e:

[Π]ρέπει ..., νοῆσαί τε ὡς οὐκ ἂν ἄλλως, ἐκτυπώματος ἔσεσθαι μέλλοντος ἰδεῖν ποικίλου πάσας ποικιλίας, τοῦτ' αὐτὸ ἐν ᾧ ἐκτυπούμενον ἐνίσταται γένοιτ' ἂν παρεσκευασμένον εὖ, πλὴν ἄμορφον ὂν ἐκείνων ἁπασῶν τῶν ἰδεῶν ὅσας μέλλοι δέχεσθαί ποθεν. ὅμοιον γὰρ ὂν τῶν ἐπεισιόντων τινὶ τὰ τῆς ἐναντίας τά τε τῆς τὸ παράπαν ἄλλης φύσεως ὁπότ' ἔλθοι δεχόμενον κακῶς ἂν ἀφομοιοῖ, τὴν αὑτοῦ παρεμφαῖνον ὄψιν. διὸ καὶ πάντων ἐκτὸς εἰδῶν εἶναι χρεὼν τὸ τὰ πάντα ἐκδεξόμενον ἐν αὑτῷ γένη, καθάπερ περὶ τὰ ἀλείμματα ὁπόσα εὐώδη τέχνῃ μηχανῶνται πρῶτον τοῦτ' αὐτὸ ὑπάρχον, ποιοῦσιν ὅτι μάλιστα ἀώδη τὰ δεξόμενα ὑγρὰ τὰς ὀσμάς: ὅσοι τε ἔν τισιν τῶν μαλακῶν σχήματα ἀπομάττειν ἐπιχειροῦσι, τὸ παράπαν σχῆμα οὐδὲν ἔνδηλον ὑπάρχειν ἐῶσι, προομαλύναντες δὲ ὅτι λειότατον ἀπεργάζονται.

[I]ntelligendum: fieri non poſſe vt vna exiſtat facies quæ omnes rerum omnium formas vultuſque contineat: variaque corporis vndique ora demonſtret: niſi subiecto prius informi aliquo corporum gremio: perinde, vt quæ in picturis ſubſternitur infectio decolor ad colorum lumina ſubuehenda. Etenim ſi erit alicuius eorum quæ in ſe recipit, ſimile receptaculum: cum quid obueniet diſſimile his quibus ſimile est: diſcordabit, opinor, vultus eius cum introgreſſi corporis vultu: nullamque exprimet ſimilitudinem. Ex quo fit: vt receptaculi ſinus, nullam propriam naturaliterque expressam habeat figuram: proptereaque informis intellegatur: omni quippe forma carens. Vt qui odora pigmenta conficiunt, ante omnia curant vt nullius ſint odoris proprii quæ condientur, ſuſceptura videlicet humidos ſuccos odoraminum; et qui materiis mollibus impreſſionique cedentibus insignire formas aliquas volunt, pure læuigatas apparant: nec vllam omnino formam in apparata levigatione apparere patiuntur.

—Chalcidius's translation (c. 321 CE) in the editio princeps *Chalcidij Viri Clariſſimi Luculenta Timaei Platonis traductio et eiuſdem argutiſſima explanatio ...* (Paris: Iodocus Badius, 1520), fol. 12v EE-FF.

Vt igitur ea quæ ſubiacet his omnibus Sylua, poſſit horum facies ſynceras minimeque interpolatas oſtendere, ipſam neceſſe eſt nullas qualitates habere.

—Chalcidius's Commentary, Ibid. fol. LXVI r.

In the Neoplatonic context of mythical exegesis the use of the mirror and reflection be-

came the main metaphor of creation, intellection, and reflexion[119] (often bearing connotations of a lesser form of reality and of truth).[120] Likewise Aquinas continues this tradition by claiming the

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[119] Plotinus (204/5-270) affirmed the impassivity of the intellect in his *Enneades*, by denying it the application of the wax and seal model in its operations (*Enneades* III: §3.6.2, 35-40; §3.6.9, 5-10). In a different passage from *Enneas* I §I.4, Plotinus stresses in a mental apprehension the thought bends back upon itself, as if resting in a smooth and luminous mirror [*Καὶ ἔοικεν ἡ ἀντίληψις εἶναι καὶ γίγνεσθαι ἀνακάμπτοντος τοῦ νοήματος καὶ τοῦ ἐνεργοῦντος τοῦ κατὰ τὸ ζῆν τῆς ψυχῆς οἷον ἀπωσθέντος πάλιν, ὥσπερ ἐν κατόπτρῳ περὶ τὸ λεῖον καὶ λαμπρὸν ἡσυχάζον*." This passage seems to relate to Plato's discussion of the liver from *Timæus* 71a5-e5, whose soothsaying abilities for the sleeper rely on its smooth, equal and free surface: "… τῆς μὲν πικρότητος ἡσυχίαν παρέχουσα τῷ μήτε κινεῖν μήτε προσάπτεσθαι τῆς ἐναντίας ἑαυτῇ φύσεως ἐθέλειν, γλυκύτητι δὲ τῇ κατ᾽ ἐκεῖνο συμφύτῳ πρὸς αὐτὸ χρωμένη καὶ πάντα ὀρθὰ καὶ λεῖα αὐτοῦ καὶ ἐλεύθερα ἀπευθύνουσα." Proclus noted in his commentary on *Timæus* 33b that: "τῆς δὲ φωτεινῆς ταύτης ὑποστάσεως ἡ λειότης σύμβολον. διὰ τί οὖν λεῖα τὰ ἄκρα τοῦ παντός; πολλῶν χάριν, φυσίν: ἵνα γὰρ συνάπτηται πρὸς τὴν ψυχὴν καὶ τὸν νοῦν ἀυτοφυῶς καὶ ἐναρμόζηται πρὸς τὰ ὑπερκόσμια φῶτα διὰ τῆς πρὸς αὐτὰ ὁμοιότητος. ἔστιν οὖν ἡ λειότης ἄκρας ἐπιτηδειότητος σημαντική, δι᾽ ἧς δέχεσθαι δύναται τὸ πᾶν τὰς ἀπὸ νοῦ καὶ ψυχῆς ἐλλάμψεις, ὥσπερ δὴ τὰ ἔνοπτρα τὰς ἐμφάσεις ὑποδέχεται κατὰ τὴν λειότητα τὴν ἑαυτῶν" (*Procli Diadochi in Platonis Timaevm Commentaria*, ed. E. Dieihl, vol. II. [Leipzig: B. G. Teubner, 1904], *Tim*. Γ. p. 80 ll. 12-19. In the fifth book of the monumental *Fons Vitæ* V.41, Avicebron (c. 1021-1070?) describes creation as: "the imprint of form on matter when it reaches this from will is like the reflection of a figure in a mirror when cast back from a viewer." Later it is the fall of the soul that is described in terms of an obfuscation of a bright mirror: "You must be aware that the soul was created having full knowledge, and so must contain within itself its own characteristic information. But once the soul has been united with a substance and has commingled with it, it is no longer in a position to receive those imprints because so much darkness of substance has overwhelmed it that its luminosity has died out and its substance has become dense. It has become something like a bright mirror to which some thick matter has been applied, whose brightness is thereby obscured and its substance made dull" (Ibn Gabirol, *The Fountain of Life (Fons Vitæ)* trans. by A. B. Jacob and L. Levin [New York: The Jewish Theological Seminary, 2005], V.41, p. 29).

[120] A resurgence in its use was noted in the Renaissance with the rise of Platonism a renewed interest in the theological anthropology of St. Augustine. So we find the same association of the featurelessness of the subject with the fidelity of impression scattered throughout the writings of Francis Bacon, writing for example in 1605: "For the mind of Man is farre from the Nature of a cleare and equall glaſſe, wherein the beames of things ſhould reflect according to their true incidence; Nay, it is rather like an inchanted glaſſe, full of superſtition and Impoſture; if it bee not deliuered and reduced" (Francis Bacon, *The Tvvoo Bookes of the Proficience and Aduancement of Learning, Diuine and Humane* [London: Henrie Tomes, 1605], Book II, fol. 55v; *The Oxford Francis Bacon*, ed. Michael Kiernan [Oxford: Clarendon Press] IV: 116). In the *Novum Organum* II.LXI the human intellect is described as a "*ſpecul[um] inæquale ad radios rerum qui ſuam naturam Naturæ rerum immiſcet, eamque diſtorquet & inficit*" (*Instauratio Magna* [London: Joannis Billium, 1620], Lib II, p. 57). Or consider: "… in inquisition of nature they ... adored the deceiving and deformed imagery which the unequal mirrors of their own minds have represented unto them" (*Valerius Terminus*, §26-27 [*The Works of Francis Bacon, ed. Jammes Spedding, Robert L. Ellis, and Douglas D. Heath* (London: Longmans, 1857) III: 224]. Instead of the faculty of memory, it is the mind itself that Bacon describes as a reflective surface where "the beams of reality" are reflected in various degrees of fidelity depending on how uneven it is. In these analogical terms, his *New organon* was meant to purge the mind of its habitudes and to level its surface for the reception of the "dry and pure light" of the true notions: "… *æquat et complanat aream ejus ad recipiendum Lumen ſiccum et purum Notionum verarum*" (*Novum Organum* II.XXXII, *Instauratio Magna*, p. 148). "*[C]ùm mentes hominum miris modis adeò obſeſſæ ſint, vt ad veros Rerum radios excipiendos ſincera & polita area prorſùs deſit*" (*Distributio Operis*, *ibid*. p. 22). For the converse analogy, where perfection is actually an imprinted pattern lost by the Fall just as the … is effaced from a golden coin see: Robert South, "Man was made in God's Image" in *Sermons Preached upon Several Occasions* (Oxford: H. Hall, 1679), pp. 127, 128. We admire the accomplishments of a human intellect which now lies defaced by sin and time "only as Antiquaries do [i.e. admire] a piece of old Coin, for the Stamp it once bore, and not for thoſe vaniſhing lineaments, and diſappearing draughts, that remain upon it at preſent." Descartes also used the seal analogy for the origins of the idea of God in thend of *meditatio tertia.* He tells us, that God gave him [*indidiſſe*] this idea while creating him in the same manner an artificer imprints a sign on his work [*ut eſſet tanquam nota artificis operi ſuo impreſſa*], not that the sign needs to be different than the work itself [*nec etiam opus eſt ut nota illa ſit aliqua res ab opere ipſo diverſa*] (AT VII: 51; CSM II: 35).

determinate nature of an organ would no less impede knowledge of all bodies [*illud quod inesset ei naturaliter impediret cognitionem aliorum*][121] in the manner a red-tainted vase colors the content, or a tongue affected by a bitter humor cannot perceive the sweet. Consider also this passage from Dante's *Paradiso*:

> The wax of such things and what shapes that wax
> are not immutable; and thus, beneath
> Idea's stamp, light shines through more or less.
>
> Thus it can be that, in the selfsame species,
> some trees bear better fruit and some bear worse,
> and men are born with different temperaments.
>
> For were the wax appropriately readied,
> and were the heaven's power at its height,
> the brightness of the seal would show completely;[122]

So the same model of the wax and the seal, when applied to the case of the intellect, leads into the following conclusion: in order for the *quidditates* or essences of the things be faithfully received, in all their absoluteness—i.e. in abstraction from the *hic et nunc* of history[123]—the intellect needs to be to a certain degree featureless.

So, given the evident fact our minds process universals, and the principles that, an *actus* receives its nature from the *obiectum*, and the operation is according to the *modus substantiæ*, Thomas argues that the *universalitas* or the *immaterialitas* of our objects of understanding indi-

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[121] "Respondeo dicendum quod necesse est dicere id quod est principium intellectualis operationis, quod dicimus animam hominis, esse quoddam principium incorporeum et subsistens. Manifestum est enim quod homo per intellectum cognoscere potest naturas omnium corporum. Quod autem potest cognoscere aliqua, oportet ut nihil eorum habeat in sua natura, quia illud quod inesset ei naturaliter impediret cognitionem aliorum; sicut videmus quod lingua infirmi quæ infecta est cholerico et amaro humore, non potest percipere aliquid dulce, sed omnia videntur ei amara. Si igitur principium intellectuale haberet in se naturam alicuius corporis, non posset omnia corpora cognoscere. Omne autem corpus habet aliquam naturam determinatam. Impossibile est igitur quod principium intellectuale sit corpus. Et similiter impossibile est quod intelligat per organum corporeum, quia etiam natura determinata illius organi corporei prohiberet cognitionem omnium corporum; sicut si aliquis determinatus color sit non solum in pupilla, sed etiam in vase vitreo, liquor infusus eiusdem coloris videtur" (Q75.A2, c. 1; cf. Q56.A2, arg. 1)

[122] *Paradiso* XIII, ll. 67-75

[123] *in sua natura absolute* and *secundum propria rationem formalem* (Q75.A5, c. 2)].

cates the *immaterialitas substantiæ intellectualis*. It was believed that if the *mens* or the *intellectus* was to conceive a meaning or behold a *species* that could apply to an indeterminate number of possible individual the mind had to be unalloyed with matter [*a materia separatus*].

It was still firmly believed in Thomas's time and down to Pomponazzi (even to critics in the early modern era) that in order to conceive natures absolutely and universally, aside from all the circumstances that anchored it to a specific point in time and place in space, it cannot rely in dispensing its function on any corporeal organ. If the intellect made use of a corporeal organ as a subject—say the second ventricle of the brain—it would never be able to abstract the *conditiones materiales* from the *phantasmata* produced by the preceding ventricle and form a universal, say the *quidditas* of fire. A physical part of the brain which, by being situated in prime matter would partake in the history of the physical world, would do injustice to its designated object.

Within the context of the Aristotelian theory of science, the owner of that brain would be able to provide a *historia* of circles, but would never be able to progress to a *scientia* of them. If all cognitive faculties were facilitated by corporeal organs, we would not be able to form as extensive an object of understanding as that of corporeal nature in general, or the circle as extending over any kind of its possible corporeal manifestations (or, we may add, even possible yet non-existing corporeal entities like hippogriffs or counterfactual realities). Much less would it be able to encompass by its operation universal being that extends beyond corporeal nature into incorporeal modes of being. Needless to say, the study of being *qua* being would not be feasible. The abstract idea of Being straddling thought and matter, self and world, which Berkeley will find so misguided, would not even be possible.

Avicenna too had argued about the immateriality of the intellect from divisibility in *The*

Deliverance, Psychology, Tr. VI, Ch. IX, and right after from the potential infinity of the intelligibles:

> Again, we have established that the supposed intelligibles which it is the function of the rational faculty actually to know one by one are potentially infinite. It is also certain that the substratum of something which can encompass infinite things cannot be a body nor a faculty in a body.[124]

So in a world where souls, their operations and their objects, are graduated in proportion to their matter-consistency, at the threshold of intellective activity we locate a *saltus*, a leap. For if there can be no medium between the *particular and the universal as proper objects of cognition, neither can there be a medium between the two corresponding modes of cognition, sensus* and *intellectus*. So while immateriality admitted degrees across all scale of cognition and just as the relative materiality of the cognizer was reflected in the relative materiality of its cognition, inversely, a grasp of absolutely immaterial universals ought to only be exercised by an absolutely immaterial *forma* or *virtus*, one that does not rely on any corporeal organ and is not said to be 'like the snub.' So, from *sensus* to *intellectus* we locate a break, a *saltus*, which sharply differentiates two orders of receiving, properly speaking. For the mark of intellectual behavior, as higher form of cognition, is that it reveals the thing in its absolute nature which could not be done unless the faculty is not absolute or simple in itself. Nevertheless the intellect is still dependent on the body *ratione obiecti*.[125]

Despite Aristotle's aspiration to affirm the continuity of nature across all being, it seemed that, though definitely smoothed, he had not effaced entirely the absolute limit set by Plato be-

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[124] Avicenna, *The Deliverance, Psychology*, Tr. VI, ch. XI, *Philosophy in the Middle Ages*, ed. Arthur Hyman and James J. Walsh (Indianapolis: Hackett Pub. Co., 1974) p. 257.

[125] "[C]orpus requiritur ad actionem intellectus, non sicut organum quo talis actio exerceatur, sed ratione obiecti" (Q75.2, ad 3)].

tween intelligible [*νοητά*] and sensible reality [*αἰσθητά*] lined up with the equally hard limit between the incorporeal [*ἀσώματα*] and corporeal [*σωματικά*].[126] The *intellectus* sets that sharp threshold beyond which the intensity of an object can no longer overwhelm the subject of cognition.

According to this well-known adage in late Scholastic thought, *excellentia sensibilium corrumpit sensum*. Dante, for instance, describes the blinding vision of two angels descending in *Purgatorio* VIII, 34-36:

> emerging and descending from above,
> two angels bearing flaming swords, of which
> the blades were broken off, without their tips.
> …
> My eyes made out their blond heads clearly, but
> my sight was dazzled by their faces—just
> like any sense bewildered by excess.[127]

It is our intellect, says Aquinas, that can approach objects of such excellence that would

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[126] The same view as relayed much later by Louis de La Forge: "… there are two kinds of thought, one which is directed towards knowledge of things which are spiritual, universal and indeterminate, and another which is directed towards bodily, particular and determinate things; that the former is truly an apanage of the mind, whereas the latter is not beyond the powers of bodies" [*Secundo loco objiciunt duo eſſe genera cogitationum, unum quidem quod pro objecto habet cognitionem rerum ſpiritualium, univerſaliusm & indeterminatarum; alterum autem quod circa res corporeas, particulares, & determinatas occupatur; primum quidem revera ad ſpiritum pertinere, ſed ſecundum vires corporis non excedere*] (La Forge, *Treatise on the Human Mind*, p. 40; *Tractatus de Mente Humana,* 1669, p. 9)]. To which the response is: "Nam quæſo, noſtræ ſenſationes minuſne ſunt perceptiones, aut cogitationes quia corpus habent pro objecto? … nonne omnis cogitatio ſecum adfert characterem & notam mentis? (*Tractatus*, p. 12)" And later he defines *intellectus purus* as one of the four species of the *facultas percipiendi, aut cognoſcendi* as that "… per quem, ut diximus, mens ſine aliqua idea corporea percipit omne genus objectorum, tam materialium, quam immaterialium" (43). In fact, we would have to wait until Girolamo Fracastoro who wrote (published in 1555 two years *post mortem*): "Of those forms that exist in matter, moreover, some are singular and others are universal. But the intellect is not in potency in regards to the singular, but only the universal ones, and contrapositively, matter is such that is potential in regards to the singular forms, but not to universal ones if only *per accidens*. Therefore nothing prevents the intellect be a material form, since itself is not received, but only universal forms do" [*Præterea formarum, quæ ſunt in materia, aliæ ſunt ſingulares, aliæ vniuerſales. ad ſingulares autem non eſt in potentia intellectus, ſed ad vniuerſales tantum, contrario modo, ac materia ſe habet, quæ ad ſingulares quidem potentia eſt, ad vniuerſales non niſi per accidens. Nihil igitur prohibet materialem formam eſſe intellectum, ſed singularem. quare nec ipſam ſuſcipere, ſed vniuerſales tantum formas*] Hieronymus Fracastorius, *Fracastorivs sive De Anima, Dialogvs*, in *Opera Omnia*, (Venice, Iuntæ, 1555), f. 214r.

[127] *Divine Comedy*, trans. Allen Mandelbaum, *Purgatorio,* Canto VIII, ll. 25-36.

otherwise be unbearable for the senses.[128] The possibility of such a beatific grasp of an eminent object must be a mark of the immateriality of the *intellectus*.

[128] "… sensitivum patitur a sensibili cum corporis immutatione, unde excellentia sensibilium corrumpit sensum. Quod in intellectu non contingit, nam intellectus intelligens maxima intelligibilium, magis potest postmodum intelligere minora" (Q75.A3, ad 2).

I.5 Saltus between Human and Angel

Just as in the last chapter of book I of *De Partibus*, Aristotle promoted the study of our companion (*σύντροφον*) and more familiar beings, as a guide for understanding loftier beings over the scale of perfection, Thomas had argued that the only kind of grasp we can have of beings higher than us is by analogy to our own cognitive operations and their proper objects. So whatever loftier spheres of being can be humanly contemplated (including one's own mind) they could only be so by analogy to what we learn about the more humble creatures of common sense experience.[129]

One way would be to begin with the *sine qua non* of human mentality—that it understands *per conversionem ad phantasmata*—and conceptualize the mechanics of a higher form of intuitive intellection by negating the dependency of human intellection on corporeal images and discursive reason. If we take the particular form of knowledge available to human beings for granted then a higher order of intellectual power could be argued for by the axiom that the imperfect under some kind presupposes the perfect: "[*i*]*n quocumque autem genere invenitur aliquid imperfectum, oportet praeexistere aliquid perfectum in genere illo."*[130]

They are called: *naturæ intellectuales*, *formæ subsistentes*, *substantia separatæ*, *substan-*

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[129] Even if Philipp Melachthon silenced with his pen the importance of analogy as a path for human reason to encompass its creator was silenced, and restricted the modes of knowing of the Fallen man to solely abstractive cognition (as opposed to intuitive cognition) he never ceased to underline the importance of natural philosophy for Christian education. Cf. Giovanni Cifoletti, "Kepler's De Quantitatibus," *Annals of Science* 43, issue 3, (July 1986): 217-218; Sachiko Kusakawa, *The Transformation of Natural Philosophy: The Case of Philip Melanchthon* (Cambridge: Cambridge University Press, 1995)

[130] Q51.A1, c. 1

tiæ intelligibiles, *formæ simplices* or simply put, proper intelligences.[131] As we ascend the ladder of perfection among intelligences themselves to these bonafide subsistent intelligences, so their cognitive power increases. We in fact rely on sense perception to intuit the particular, the disposition a thing has *extra animam*, the angels understand the same world of singular beings through the universal, by divinely infused species (Q86.A1, co 1).

This allows them to refer to all the creation, material and immaterial, by so much more simply, unifiedly and universally, by how much their perfection determines the functional limits of their intellects. And one angel can be higher than another on the basis of how much more properly, simply, universally it understands creation (Q55.A3, co 1-2).

Consider the following illustration: a seraph can know the same world more universally than a cherub, and that of a throne, etc going down the angelic hierarchy, no member of which will need to consult sensible particulars, nor to extract phantasms in order to be apprised of the things in their individuality as humans do. A layman can only notice these spheres by observation and put them under general notions. The same planetary orbits, Kepler determined relatively to the convergence of his three principles. Of the same spheres, a Newton can be privy to a more unified theory than Kepler, in fact deducing one law from the other. Finally, the same motions of the spheres can be heard by an angel as music. So though angels and humans can make reference

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[131] Dante called them *intelligenze* or *sostanze separate* in the *Convivio* II.4-5(a); "… [T]he movers thereof are substances sejunct from matter, to wit, Intelligences, which are vulgarly called Angels" [*The Convivio of Dante Alighieri*, trans. Philip H. Wicksteed (London, J. M. Dent, 1908), p .78]. By the time of Pomponazzi they were called *Intelligentiae*, i.e. plainly Intelligences to signify they consist in thinking and actually ever do so. Thomas notes that, the separate substances or angels translated into 'intellectus' or 'mentes' from Greek while the same substances are translated into 'intelligentiæ' in translations from Arabic, perhaps on the basis they always think, and that intelligence signifies that very activity of understanding (Q78.A10, c 1). Similarly, Dante writes: "… the sejunct intelligences gaze continuously upon this lady, the human intelligence may not do this, because human nature requires many things besides speculation(whereby the intellect and reason are fed) to sustain it. Wherefore our wisdom is sometimes only in habit and not in act . And this is not with the other intelligences whom the intellectual nature by itself completes (*Conv*. III.13, p. 207)."

or intend the same singular things [*convertendo ad aliquid*], there is obvious an order of perfection according to their proper and natural object [*obiectum proprium* OR *connaturalis*]. Alexander Pope would ask rhetorically, when explaining the shortcomings of human sense:

> If Nature thunder'd in his opening ears,
> And ſtunn'd him with the muſic of the Spheres,
> How would he wiſh, that Heav'n had left him still
> The whiſp'ring Zephyr, and the purling Rill?[132]

Lower spiritual substances are required by nature to seek their intelligible perfection *a corporibus, et per corpora.*[133] But, the proper object of an angelic intellect is a *substantia intelligibilis a corpore separata* (Q84.A7, co 1), i.e. its own self, by which divinely instituted innate content it can comprehend lower or higher things in creation. But the proper object of the human intellect which is *coniunctus corpori* is a *natura* existing in corporeal matter as an individual.[134]

Just as the move effected from the human cognitive power to its metaphysical composition by the principle that *receptum est in recipiente secundum modum recipientis*, so, along the same lines, the angelic cognitive power corresponds to a more exalted, superhuman form of existence. This means that Aquinas makes a given cognitive virtue *natural* and *essential* to a particular subject. If essential to a specific form of life, and instrumentalized by an equally specific set of structures, a *gradus* of cognitive power makes part of that nature. So if the *gradus* of cognitive power is not merely an accidental feature that might be augmented or diminished, no subject can acquire a different level of cognition without also changing its nature completely, i.e. without degenerating into something else.

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[132] Alexander Pope, *An Essay on Man* (J. Wilford: London, 1733) p. 13, ll. 227-230.

[133] "[C]onnaturale est intellectui nostro, secundum statum praesentis vitae, quod ad materialia et sensibilia respiciat," (Q87 A1, c2); "[O]peratio intellectualis naturalem ordinem habet ad ea quæ sunt extra (Q94.A2, c3)].

[134] "… quidditas sive natura in materia corporali existens;" "ea quæ sunt extra" (Q94.A2, co 3); formæ individuales (passim).

In fact, not even beyond this life and separated from its mortal coil—as a stone is artificially resisted its natural inclination to the center of the earth—could the human soul claim the object of the angelic knowledge. For if it did, that would mean that, even worse than the bodily condition being superfluous, it had all along been an impediment to an otherwise angelic point-of-view that ought to be restored in the next life. What is more, that would contradict the doctrine of the Purgatory and the Resurrection of the body. A human is no angel, not even in his prelapsarian state; and neither will he ever become one, not even in its glorified state. This of course goes both ways. If human souls were related to bodies merely as movers, as *formæ assistentes* (a thesis that was made actually the 123 position out of the 219 condemned in 1277)[135] they would be not relevant to their acquiring of knowledge and the soul's embodiment would be in vain. If on the other hand angels or intelligences were the *formæ informantes* of the celestial bodies they would probably need external bodies to know by sense just like human souls.[136] Human souls and angelic souls stand on different levels of perfection and each level of perfection corresponds to a particular degree of knowledge of creation.

On this account, the capacity to understand things that exist *extra* through species acquired by our encounters of our material selves with the material world, no matter how limited, became distinctly and uniquely human. These limitations were considered part of human nature so no one could ask for a more perfect form of knowledge, anymore than a rock can demand to see.[137] The degree to which the material world is ingrained in a given being plays a vital part in

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[135] Étienne Tempier, "Condemnation of 219 Propositions [1277]," Ch. 18 in *Medieval Political Philosophy; A Sourcebook*, trans. E.L. Fortin and P. D. O'Neill. ed. R. Lerner and M. Mahdi. (New York: Cornell, 2011), 348.

[136] Pomponazzi cap. VIII, summarizing Thomas's argument *ST* Ia Q51 and *SCG* II, cap. 51.

[137] Or as Meister Eckhardt puts it: "… the stone is not aware it is God and it is this unawareness that makes it a stone" (introduction to Roger Caillois, *The Writing of Stones*, translated by Barbara Bray [Charlottesville: University Press of Virginia, 1985], XV).

completing this *ordo rerum*, so that a seeming inattainability of a purer form of existence or more exalted form of knowledge be justified as a *negatio*—after the manner that sight is naturally negated of the stone—instead of a *privatio*—after the manner sight is unnaturally negated of a blind man.

Thus, when discussing the very same possibility over the course of reviewing the arguments for the immortality of the soul,[138] Pietro Pomponazzi claimed that the human way of understanding, *moueri ab obiecto & non indigere ſubiecto*, cannot be transformed to the way an intelligence understands, *absque indigentia corporis vt ſubiecti & obiecti*, as if this were an accidental feature of being human. Just as the sensitive part of the soul cannot know in the same manner the intellectual part know, an intellectual soul cannot know in the manner an Intelligence knows. For if the essential operations of a thing could be transformed—operation after all follows being [*operatio ſequatur eſſe* (IV, p. 12)],—one nature would be able to transform into another, which is impossible. If a human soul will progress to a next life as the same person, he may not ever hear the music of the spheres, not even in his glorified state.

So just as the object and operation of the *sensus* and *imaginatio* was previously shown to be sharply distinguished from that of the *intellectus* an entity that consists entirely in their intellective powers must, by extension, be sharply distinguished by beings only partly intellectual. And just as there is no medium between the particular and the universal, there can be no medium between a being that gradually draws knowledge from particular sensible forms and one that is

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[138] "Neque apud Ariſtotelem fingendum eſt quod iſte modus intelligendi intellectus humani ſit ei accidentalis, ſcilicet moueri ab obiecto & non indigere ſubiecto, tum quia vnius rei operandi eſſentialis, tum quia ſicut modas eſt tantùm vous modus, ſenſitiui nunquam tranſmutarur in modum intelligentiæ vel intellectus humani, neque modus intelligentiæ in modum humani vel ſenſitiui, ita pariter modus humanus intelligendi non videtur poſle tranſmutari in modum intelligentiæ, quod eſſet ſi intelligeret abſque indigentia corporis vt ſubiecti & obiecti : hoc etiam firmatur, quia ſic natura tranſmutaretur in alteram naturam, cum operationes eſſentiales tranſmutarentur" (Pietro Pomponazzi, *De Immortalitate Animæ* [Bologna: Justinianus Ruberiensis, 1516] ch. IX, p.56).

already completed by universal knowledge. Drawing on the analogy of the human *intellectus passibilis* with the *prima materia* previously mentioned, Aquinas adds now that the human *intellectus* is related to the angelic one just as prime matter is related to organized matters [*materia communis*]: whereas the potencies of higher bodies are naturally completed by their forms, prime matter is completed in a less perfect way, being successively informed now by one form, now another. There is a *saltus* between a successively perfected human *anima* that knows by abstraction from below and from *extra*, to a *mens angelica* that is naturally perfected from above and *intus*.

> Et secundum hoc duplex est *liber*, unus scilicet scriptus *intus*, qui est Dei aeterna ars et sapientia; et alius scriptus *foris*, scilicet mundus sensibilis. Cum igitur esset una creatura, quæ sensum habebat *intus* ad cognitionem libri *interioris*, ut angelus, et alia, quæ totum sensum habebat *foris*, ut quodlibet animal brutum; ad perfectionem universitatis debuit fieri creatura, quæ hoc sensu duplici esset praedita, ad cognitionem libri scripti i*ntus et foris*, id est sapientiæ et sui operis. [139]

[139] St. Bonaventure, *Breviloquium*, Pars II, Ch. XI, *Opera Omnia S. Bonaventuræ* (Quaracchi: St. Bovanture College Press, 1891), V: 229.

I.6 Matter normalized

In conclusion, Aquinas meant to normalize the status of enmattered existence of the human soul, and, thus, declare the separation of the soul in the afterlife as *prœter* or *supra naturam*; as well as to normalize the specific form of knowledge such an existence imparts. The worldview afforded by humans processing species drawn from matter is as 'amphibious' between the world of *sensibilia* and *intelligibilia*, as 'amphibious' is their being between corporeal and spiritual.[140]

If to be moved *ab obiecto & non ſubiecto*, is an operation linked to human nature as such, the world of particulars complements the human cognitive power in a similar manner to the way oxygen complements the lung. In fact, Thomas believes that human minds intend towards an external world as naturally as the fire extends to the heating body,[141] the only difference being that: the heating of the fire as a transitive action requires the *formal principle of operation*, as he calls the accidental form of heat transmitted, be something external to the agent; while the immanent action of cognition requires its own principle, the sensible species, be internal to the agent.

Like all natures within that *spectrum* of materiality, ranging from prime matter to God, the human being took on a unique station in the order of perfection [*ordo rerum*]. And in a world where the knowing power [*vis cognitiva*] scaled up along this order of perfection—from human, to angel, to the first act—the dignity of the human being was tied to its unique point-of-view: among all substances capable of reason, humans have the unique ability to attain knowledge by

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[140] Thomas Browne's expression comes from: "we are onely that amphibious piece between a corporal and ſpiritual Eſſence, that middle form that links thoſe two together, and makes good the Method of God and Nature, that jumps not from extreams, but unites the incompatible diſtances by ſome middle and participating natures" [Thomas Browne, *Religio Medici* (8th ed.), (London; R. Scot, T. Baſſet, J. Wright, R. Chiſwell, 1682), p. 78].

[141] In the medieval sense of *intendere*, even though Thomas uses it only in practical considerations and instead employs the *convertendo ad aliquid* to signify intentionality. The passage with the fire and its reference goes like this: "Et ita se habet obiectum unitum potentiæ ad huiusmodi actionem, sicut forma quæ est principium actionis in aliis agentibus, sicut enim calor est principium formale calefactionis in igne, ita species rei visæ est principium formale visionis in oculo" (*ST* Ia Q56.A1 c.).

extracting content out of a world external to themselves. Seeking a form of knowledge or a source of certainty from a different source than these pre-established contact points of sense with this external world, would be to ask for the impossible; as if an insect wanted to be a mammal. Human beings are not angels with their wings clipped as it were, but a 'wing-less' creature by nature. Though soaring high with its intellectual capacities, it is still grounded in this world as a much-needed piece to complete the order of perfection.

If Berkeley could put together his *esse est percipi et percipere* it was because he could assert that all the immediate objects of perception are ideas. But to suppose, in the language of the *Summa*, that the *obiectum proprium* of the human soul is something intrinsic and of a *spiritual* or *intentional* existence, would violate the order of perfection within which man found its place. For what it is worth then, Berkeley's immaterialism is modeled on an angelic mode of perception, *mutatis mutandis*, insofar as he poses a community of self-conscious substances that are perfected by connatural species by an *influentia* or an *effluxus* of species directly from the mind of God, not by abstraction from material particulars.

So beyond just looking for an existential support or the causal origins of the qualities we are acquainted with, the subsistence of the external world is further motivated in Aquinas's mind by the obligation to affirm the usefulness of the body, the naturalness of the embodied cognition, and by extension, the dignity of the study of concrete things, i.e. natural philosophy, where *omnia dicuntur sicut simum*.

This seems more urgent when we take onto account Thomas was writing in the aftermath of the Gnostic revival in Languedoc, and against the view that the material world was created as a means for a cosmic deception. To say that the human being and the world were created for one

another, neither as a punishment—because God cannot be vengeful—nor as a redundancy—because God does nothing in vain—is really to affirm divine benevolence against an absolute skepticism about the reality and the usefulness of matter.

Just as early Christian philosophy had to affirm the existential import, as it were, of scriptural facts, against the first Gnostic sects in the middle of the 2nd century AD, which declared Christ's body to be a *phantasma*, (a ghost or illusion), and deplored the idea that the messiah could have anything to do with the vile material world, so the Latin West Christianity of the 13th century had to define itself in times where the goodness and usefulness of the material world (*δημιουργία*) was thrown into doubt by a neo-Gnostic movement, known as Catharism, that reached its heights in the late 1100s in the land of Languedoc.[142] The patron saint of a learned order that was instituted to battle heresies, St. Dominic spent years there preaching in the hope of dispelling the Catharist doubt over the inherent goodness and truthfulness of material reality.[143]

Albert and Thomas, both Dominicans, must have seen in Aristotle's texts the potential for a natural theology, and so their mission to legitimize Aristotelian natural philosophy in the medieval curriculum might as well be based on the need for an apologetics of sensible matter, against the second surge of Gnosticism in the High Middle Ages. Caroline Bynum notes that:

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[142] "Reading Thomas Aquinas or the reports of Dominican inquisitors, it would appear as if a Manichean heresy, refuted by Augustine in fourth century and last identified in Church records as a heresy at the end of that century, had gone underground only to emerge eight centuries later in the gentry and aristocracy of Southern France." Roger A. Johnson. "Christians Orthodox and Heterodox; Thomas Aquinas and the 'Manichees,'" in *Peacemaking and religious violence from Thomas Aquinas to Thomas Jefferson* (Oregon; Pickwick Pub., 2009), 35-36.

[143] "The Dominicans had their origins in Dominic's ten-year struggle to win Cathars back to the Catholic faith. … The order Dominic founded was an Order of Preachers, who, like Dominic, dedicated their learned preaching to persuade Cathar heretics to give up the folly of their ways for a return to Catholic Christianity and their only hope for salvation. … By the mid 1230s Pope Gregory IX had made the Dominicans responsible for the work of the Papal inquisition in examining all surviving Cathars. … While Thomas's Dominican vocation did not require him to become a wandering preacher or a travelling inquisitor, it dead mean that he would devote his intellectual abilities to the task of establishing Catholic truth and Cathar error. This is exactly what he did, especially in his *Summa Theologiae*" (Roger A. Johnson. "Christians Orthodox and Heterodox," 43).

> Modern scholars [namely, Richard Heinzmann] have thus seen the twelfth-century insistence on bodily resurrection as a somehow incongruous theological intrusion into a philosophical position that requires escape from body for human perfection. According to this interpretation, the thirteenth-century adoption of Aristotle's definition of the soul as the form of the body (freed from Chalcidius's argument that form could not be substantial) was a philosophical and theological triumph, undergirding with satisfactory theory for the first time a biblical view of the person as human rather than spiritual. Thomas Aquinas's theory of the human being as a hylomorphic (form/matter) union of soul and body is thus read as a victory over dualism, holding as it does that "anima … non est totus homo et anima mea non est ego." The distrust and in certain key areas outright condemnation of Aquinas's ideas in the 1270s and 1280s are seen in this interpretation to stem from suspicion that, exactly in their close union of soul and body, such ideas might threaten the immortality of the soul and lend support to the hated teaching of Averroism.[144]

On the basis of this agathic mentality, Thomas chose Aristotle as the giant he would stand on, and by the same principle he also blazed his own interpretative path. For in his views he saw all suspicion about the uselessness, imperfection and unreality of the material world—brought to the fore once again in the history of Christian thought by the Gnostic sect of his time, the Cathars—would be dispelled. Roger A. Johnson notes that: "… it was the newly translated texts of Aristotle, and not the older Neo-Platonism of Augustine, that provided the antidote for the so-called Manichees of the thirteenth century."[145]

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[144] Caroline Walker Bynum, "Material Continuity, Personal Survival, and the Resurrection of the Body: A Scholastic Discussion in Its Medieval and Modern Contexts" *History of Religions* 30, no. 1 (Aug., 1990): 65-66.

[145] Roger A. Johnson. "Christians Orthodox and Heterodox," 34.

CHAPTER II. MATTER, CERTITUDE AND TRUTH

> Every substantial form, at once distinct
> from matter and conjoined to it, ingathers
> the force that is distinctively its own,
> a force unknown to us until it acts—
> it's never shown except in its effects,
> just as green boughs display the life in plants.[146]

Chapter I outlined the role of matter and materiality as a differentiator in metaphysics, cognition: In regards to metaphysics, (I), we claimed it made possible a *continuum of perfection*—from prime matter, to stone, plants, animals, men, to angels of varying degrees of purity and finally God; (II) by correspondence, matter made possible a continuum of cognitive power [*vis cognitiva* or *cognoscitiva*] from the more material forms of cognition to the less immaterial: from plant, degree zero of cognition, to animal, and the human being up to the hierarchies of the angels and finally God, who is said to know everything immaterially and by His essence. This chapter focuses on (III) the notion of matter in the theory of science, suggesting as it were a continuum of ascending certainty (*ἀκριβολογία*) and dignity among the scientific disciplines.

To this end, the focus will turn to a mid-sixteenth-century debate surrounding the status of the abstract disciplines (astronomy, geometry, arithmetic) and the mixed (music, optics, mechanics) against the concrete ones (physics, medicine, zoology) instigated by the publishing of a commentary on *De certitudine mathematicarum disciplinarum*, by humanist astronomer and natural philosopher Alessandro Piccolomini in 1547.

Piccolomini argued in this little essay (*De certitudine mathematicarum disciplinarum*) that the certainty experienced in mathematics has to do with the matter-independence of their demonstrations. If geometric or arithmetical subjects are grasped *per sui essentias* along with everything that may be deduced from their natures, it is because the truths they suggest are not tied to any material substratum. The controversial conclusion reached in the commentary is that mathematics actually falls short of the venerable ideal of demonstrative science [*ἐπιστήμη ἀποδεικτική*] as expounded in Aristotle's *Analytica Posteriora*. For whatever undeniable exactitude obtains in its attenuated subject matter, it could only be due to its dealings with the surface-effects of our reality, many removes away from the actual subjects reality is dispensed in and which scientific knowledge ought to make reference to.

Ultimately, there did not seem to be any way of reconciling the certainty experienced in the private worlds of abstract imagination and the concrete reality of the public world. Keeping in line with Thomas's apologetics for the human understanding from Chapter I, *if there were a natural* substance *that could exist in our intellect exactly as it existed in the real world,* per sui essentiam, *it would certainly not be of our world; and if there were a mode of cognition that would render the intrinsic nature of our sensible world known as evidently as those subjects of geometry, that would certainly not be human*.

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[146] *Divine Comedy*, trans. Allen Mandelbaum, *Purgatorio*, Canto XVIII, ll. 49-54.

II.1 Historical Background: Sylva: Scarcity or Saturation

By the middle of the sixteenth century, natural philosophy seemed for the first time to be branching out into actual domains of institutionalized inquiry. The disciplinary boundaries of each domain were determined by that part of nature that was in each case subject to observation, report and theorization: the physicist, the phytologist, the physiologist, the physician and the physiognomist were meant, just as the root word *phys-* suggests in Peripatetic contexts, to study *principles of motion and rest*, not in the abstract but *insofar as they were delimited by their proper and proximate substrata*, whether they be elements and mixtures, plants and animals, the functions and temperaments of the human organs and the expressions of the human face.

And so it was that, from the first private *herbaria* of Luca Ghini and Conrad Gessner, to the first *horti academici* of Pisa (c. 1544), Padua (c. 1545), Ferrara (c. 1550) and Rome (c. 1566); the first dedicated chairs on medical botany (1534) and natural philosophy (1577); the first appointed *explicator chirurgiæ* in Padua (1520), to the first dedicated chair of anatomy (1537) and the first permanent anatomy theater (1594-5);[147] not to mention the proliferation of astronomical observatories all over Europe and beyond:[148] these are all indications that many things that once passed as objects of private curiosity[149] was being turned into an object of collec-

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[147] Cynthia Klestinec. *Theaters of Anatomy: Students, Teachers, and Traditions of Dissection in Renaissance Venice* (Baltimore, MA: Johns Hopkins University Press, 2020), pp. 73-79.

[148] The Jesuit Ferdinand Verbiest being charge of the Beijing astronomy observatory in the mid-seventeenth century, while in 1673, he supervised the rebuilding of some of the instruments.

[149] Note however that the *Materia medica* and astronomy were never really just objects of private curiosity. Ann Blair writes about Zwingler's *Theatrum Humanæ Vitæ* (1565) that: "Even more than pleasure, the diversity of examples provides utility, of an explicitly public kind. … Like the world itself, Zwinger's *Theatrum* offers something for everyone, in which personal displeasure is subsumed under the common good of all. Zwinger acknowledges that, like a mapmaker, he has illustrated only the major headings and invites the studious reader to supplement them by pointing out smaller places or empty ones. The *THV* is thus open to public contributions as well as public use" (Ann Blair, "Historia in Zwinger's *Theatrum humanae vitae*" in Gianna Pomata and Nancy G. Siraisi, eds. *Historia: Empiricism and Erudition in Early Modern Europe* [Cambridge, Mass.: MIT Press, 2005], p. 278).

tive fascination, public utility, and university instruction.

Still, one might say, natural philosophy had remained unstudied for its own sake, i.e. a branch of theoretical philosophy, as it was perhaps originally meant by Aristotle and Theophrastus. Even in the time of Francis Bacon natural philosophy was often considered: "… a science of passage, to season a little young and unripe wits, and to serve for an introduction to other arts, specially physic and the practical mathematics."[150] This comment makes it seem that the placement of natural philosophy within the classical scheme of formal education had remained in some cases every bit as problematic as when Aristotelian natural philosophy was just beginning to gain ground into the High Medieval Liberal Arts education.

Arguably, none of the Liberal Arts was appropriate to a particular *materia sensibilis*, for which reason they were considered all the more appropriate for the cultivation of an equally immaterial agent, the mind. The *trivium* remained, as originally meant by the great educators of the Middle Ages, a means for bettering the soul by its turning inward, rather than turning to any extramental substances: though the propaedeutic discipline of *grammatica* took up a living language as its subject, it rather revolved around pure acts of thought (or higher-order thoughts they called *intentiones secundæ*) and studied, along with the *dialectica*, the formal rules that govern the concatenation of these acts in discourse; *rhetorica* was studied in its capacity to motivate, persuade or affect a fellow human psyche by words, argument and illustration. Finally, the pervading formalism of the arts of the *quadrivium* (and their appropriateness for teaching) was captured in an often-quoted remark by Aristotle that though young people might be made wise (*σοφοί*) in abstract matters, like geometry and mathematics, they could not be made practically

[150] *Filum Labyrinthi*, §6.

wise (*φρόνιμοι*), much less physicists or philosophers for that matter. The reason is that the latter subjects demand a lifelong acquaintance with concrete particulars, before one finally becomes *peritus* (skilled, versed, experienced).[151]

To whatever ossified remnant of the old habits of teaching he himself was exposed as a student in Cambridge, Francis Bacon would impute its rigid formalism to a lack of matter: "minds emptie & unfraught with matter" as he complaints in his *Advancement of Learning* (1605), while the learning seemed to have been reduced "to certaine emptie and barren Generalities; beeing but the verie Huskes, and Shales of Sciences, all the kernell beeing forced out, and expulsed, with the torture and presse of the *Methode.*"[152] Bacon points to Cicero's use of *silva* (woodland) and *supellex* (furnishings) as metaphors for "ſtuffe and varietie."[153] The scarcity of matter in the outlook of the Schools could only be rectified by the student's own encounters with the real world, which lie beyond the subject of formal education. For whatever universal truths or

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[151] It is interesting to see how this tension between the study of the abstract and the study of the concrete was internalized in the course of life of some Renaissance thinkers. Like so many others, Jean Fernel, famed physician from the University of Paris, maintained such broad research interests that stranded both the abstract and the concrete. In his early years, in fact, he thought of devoting himself completely to astronomy and mathematics. In the account of this time in his life, however, by Guillaume Plancy, Fernel's student, biographer and literary executor, that early passion for astronomy was treated most apologetically, as a fascination by which one risks of being "caught in the toils of an enduring and delighted slavery, which holds us in bondage and serfdom" [translated by Charles Sherrington in *The Endeavour of Jean Fernel*, (Cambridge: Cambridge University Press, 1964), 153-4; cited in *The Physiologia of Jean Fernel* (1567), trans. John M. Forrester. Transactions of the American Philosophical Society, v. 93, pt. 1 (Philadelphia: American Philosophical Society, 2003). This biographical sketch was originally included in the 1610 edition of *Universa Medicina* (Hanociæ: Claudius Marnius,1610)]. He reports those juvenile interests were responsible for Fernel's alienation from his home, his wife and children. It is interesting to note that, drawn as Fernel might have been by an unconscious drive to reconcile his formal profession with his earlier passion for astrology and mathematics he had to relinquish suddenly due to a family crisis, he wrote one of his great works, the *De Abditis*, on the subject of a theory of disease that is rooted in the motions and dispositions of heavenly bodies.

[152] Francis Bacon, *The Tvvoo Bookes of the Proficience and Aduancement of Learning, diuine and Humane* (London: Henrie Tomes, 1605), Book II, p. 64r.

[153] *Ibid*., Bk. II, p. 5r: *silva rerum*, *ac sententiarum* in Cicero, *De Oratore* III.26.103; or, as we may add, the *silva medicinæ* in Pliny; "Verecundus erit usus oratoriæ quasi supellectilis. Supellex est enim quodam modo nostra quæ est in ornamentis alia rerum alia verborum" (*Orator* 24.80). In Bacon's own *Sylva Sylvarum* (1626-7) *sylva* conveys the meaning of a store of particulars, or a database of experiments. Later on, for example, in Dec. 1st 1684, William Petty was reported to have prepared a "Supellex Philosophica" for the Dublin Philosophical Society, containing a list of "40 instruments requisite to carry on the designs of this society" (*Minutes of the Philosophical Society of Dublin*. British Museum Ad. Papers, 4811).

precepts these materials were supposed to be distilled into, they would do so through a chronic experience of the world that was utterly private and coextensive with the life of the learner, over lessons that could not in any way be instilled through instruction.

On the other hand, the 16th century saw the publishing and wide dissemination of many *historiæ* about the natural world, ancient and modern: in addition to the wide circulation of Aristotle's *De animalibus* (1476), Theophrastus' *De historia plantarum*, of Pliny's *Libri naturalis historiæ* (Venice, 1469) and the incredibly successful Dioscurides' *De materia medica* (1478), new *historiæ* were written over the animal world at large or a natural kind in focus: Leonhart Fuchs's *De historia stirpium* (Basel, 1542); Pierre Belon's *L'Histoire de la nature des oyseaux* (Paris, 1551-1555); Conrad Gessner's *Historiæ animalium* (Zurich, 1551-1558); Guillaume Rondelet's *De piscibus marinis* (Lyon, 1554); Ippolito Salviani's *Aquatilium animantium historiæ* (Rome, 1554-1558); as well as over the inorganic and the mineral such as Georg Agricola's *De re metallica* (Basel, 1556), various *historiæ* of architecture (1485), the arts of distillation (1500), military and civil engineering, especially the very widely circulated pseudo-Aristotelian *Mechanica* (1517, 1525). The wide circulation of such printed natural histories facilitated the transliteration [or the spelling out] of experience and exposition [*experimenta* and *ostensiones*] into descriptions, thus importing the deliverances of personal experience [*peritia*] into the common order of universal meanings and textual reference, effectively rendering natural history subject to the humanist method and subservient to its *programme.*[154]

Nevertheless, this emerging database of reports from encounters with natural substances, was built on empirical statements that fell short of the metaphysical requirements set by the sci-

[154] Cf. Pomata, Gianna Pomata and Nancy G. Siraisi, eds *Historia: Empiricism and Erudition in Early Modern Europe* (Cambridge, Mass.: MIT Press, 2005).

entific framework they were working within. For, in a philosophical framework like the Peripatetic one that took the first principles of demonstration to also be the first principles of Being, i.e. substances; and where all scientifically-meaningful phenomena were said *sicut simitas*—like the 'snub' and not like the 'curved'—all the observations collected in the *historiæ* should eventually be grounded in some substantial nature. The scientific understanding of the various observable traits and behaviors historicized required them be tied back to the particular units sublunar reality was dispensed in. But the descriptions amassed in these *historiæ*, no matter how exhaustive or how wondrous, were after all reports of the accidental; mere effects and afterimages of substances:[155] "never shown except in its effects,/ just as green boughs display the life in plants."[156]

There seemed to be noway of tracing them back into the conceptual fold of their natures, any more than there is a way for a world historian today of definitively tracing a particular course of events in human history back into the minds and hearts of all those figures implicated within. So despite the proliferation of research programmes around Europe and the publishing success of *historiæ* written on various subjects along the *scala Naturæ*—from the mineral to the

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[155] Jean Fernel, *De Abditis*, Book I, ch. 2, p. 9: "De his nihil certum, nihil constans, nihil omnium consensu probatum definiri posse sentio, quandiu mens humana corporis hoc veluti ergastulo inclusa, neque materia, neque formam sensibus cognoscit."—Petrus Ramus's *Dialectique* (Paris, 1555), Book I pg 8 ll 14-21: "Or la cognoiſſance des formes en chacune choſe eſt fort difficile & cachée à l'homme, & ſi elles ſont veües, elles ſont bien ſouuent ſans nom: comme tu vois a l'œil vne main, vne eſpée, vn anneau par ſa forme, & neantmoins tu ne pourrois dire ny exprimer chacune d'icelles formes par ſon nom, & à peine certes par longue circuition de langage."—Philipp Melanchthon, *Erotemata Dialectices* (1547), fol. 13v: "Hæc definitio [of substance] communis eſt Deo, & creatis ſubſtantijs. Sed de creatis traditur definitio illuſtrior, quia mens humana per accidentia agnoſcit ſubstantiam. Non enim cernimus oculis ſubſtantias tectas accidentibus, Sed mente eas agnoſcimus. Cùm uidemus aquam manere eandem, ſiue ſit frigida, ſiue ſit calida, raciocinamur, aliud quiddam eſſe formas illas diſcedentes, & aliud quod eas ſuſtinet. Eſt ergo ſatis accommodata definitio:Subſtantia eſt Ens, quod habet proprium eſſe, & ſuſtimet accidentia. ¶ Hac qualicunque deſcriptione contentiſimus, & cogitemus, quàm ſit imbecilla acies humanæ mentis, quæ quaſi foris & procul res aſpicit, nec intus eas contemplatur. Et accidentia, quantitates, qualitates, effectiones, paſſiones conſideremus, quantum conceditur, & Deo gratias agamus, quòd aliquo modo & ſeſe, & naturam rerum nobis oſtendit, & alio quas noticias certas tradidit, & adpetamus conſuetudinem cœleſtem, in qua noticia Dei & aliarum rerum erit illuſtrior."

[156] *Divine Comedy*, trans. Allen Mandelbaum, *Purgatorio*, Canto XVIII, ll. 43-54.

animal and the celestial—natural philosophy appeared to have fallen short of advancing to the final stage of inquiry as laid out by Aristotle, the *scientia*.

There appeared indeed particularly thorough, if not monumental, works like Gessner's *Historiæ Animalium* verging on prolixity or works of straight-forward practical utility like Agricola's *De Re Metallica*; but *of hardly any more demonstrative value* than the ancient treatises by Aristotle, Theophrastus and Pliny the Elder which had already been in wide print circulation. Though continually enriched with detailed reports of new creatures and punctuated with natural curiosities and monstrosities, these reports did not show any progress towards the promised ascension to the first principles of a mineralogy, a botany, a zoology; so much so that the *sylva* metaphor was invoked by Bacon in illustration of both extremes: For the same *sylva* that was lacking in the formalist education of the Arts, as content, could as well entrap the aspiring student of nature, as a forest and labyrinth of the particulars, a *sylva particularium* or *experientiæ*, and offset them from the ultimate theoretical goal, the *scientia*. Matter gives the occasions for the mind to operate on and inform its judgment as much as it diffracts its light. And, just as the *dogmatici* explore the structure of their own mental worlds, like spiders make cobwebs out of themselves, the *empirici* are occasionally lost in a lucriferous collecting particulars, like ants:

Qvi tractauerunt Scientias, aut Empirici, aut Dogmatici fuerunt. Empirici, formicæ more, congerunt tantùm & utuntur: Rationales, arancarum more, telas ex ſe conficiunt: Apis verò ratio media eſt, quæ materiam ex floribus horti & agri elicit; ſed tamen eam propriâ facultate vertit & digerit. Neque abſimile Philoſophiæ verum opificium eſt; quod nec Mentis viribus tantùm aut præcipuè nititur, neque ex Hiſtoria Naturali & Mechanicis Experimentis præbitam materiam, in Memoriâ integram, ſed in Intellectu mutatam & ſubactam reponit. Itaque ex harum facultatum (Experimentalis ſcilicet, & Rationalis) arctiore & sanctiore fœdere (quod adhuc factum non est) benè ſperandum eſt.

Lib. I, Aph. XCV of *Novum Organum* in Francisci de Verulamio, *Instauratio Magna* (London; Joannis Billium, 1620), p. 115.

Thoſe who have treated the *Sciences*, were either *Empirics*, or *Rationaliſts*. The Empirics, like Ants, only lay up Stores, and uſe them; the Rationaliſts, like Spiders, ſpin Webs out of themſelves: but the Bee takes a middle Courſe, gathering her Matter from the Flowers of the Field and Garden; and digeſting and preparing it by her native Powers. In like manner, that is the true Office and Work of Philoſophy, which, not truſting too much the Faculties of the Mind, does not lay up the Matter, afforded by *Natural History* and *Mechanical Experience*, entire or unfaſhion'd, in the Memory; but treaſures it, after being firſt elaborated and digeſted in the Underſtanding: and, therefore, we have a good Ground of Hope, from the cloſe and ſtrict Union of the experimental and rational faculty; which have not hitherto been united.

Translated by Peter Shaw in *The Philosophical Works of Francis Bacon* (London: J. J. and P. Knapton et al. 1733) II: 392.

Bacon's classical opposition between reasoners likened to spiders, on the one hand, and experimenters likened to ants on the other, finds a literal application in a crucial mid-fifteenth century debate regarding the status of the abstract disciplines (logic, geometry, arithmetic, astronomy) against the concrete ones (physics, medicine, zoology), and one that would determine, to a certain extent, the fate of natural philosophical inquiry of the next century.

The story begins with humanist astronomer and natural philosopher Alessandro Piccolomini (1508-1579) claiming in his 1547 commentary on pseudo-Aristotle's *Quæstiones Mechan-*

icæ[157] that *whatever certainty obtains in mathematical demonstrations it is due to their dealings with the quantitative surface-effects of our reality*, many removes away from the actual subjects reality is dispensed in, to wit, full-blown Aristotelian substances. The essay could have been targeting mathematicizing philosophers or philosophizing mathematicians working along what remained of the nominalist vein in the University of Paris.[158] Across the Italian institutions, however, it instigated a lively debate on which of the available disciplines of knowing exemplified best the venerable model of *ἐπιστήμη ἀποδεικτική* as laid out in Aristotle's *Analytica posteriora*. In effect, the question to be settled was what scientific denomination across the division between the concrete (physics, zoology, medicine), the abstract (arithmetic, geometry, astronomy) or the mixed (optics, music, mechanics) had a better claim to, what became known through the High-Medieval Latin commentators as, the *demonstratio potissima*, or the highest sort of demonstration.

Two camps suggested themselves against one another: the natural philosophers, such as: Alessandro Piccolomini, and Benet Pereira (1535-1610) with the Coimbran fathers; versus the mathematicians, such as: Francesco Barozzi (1537-1604), Giambattista Benedetti (1530-1590)

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[157] Alexander Piccolomini, "Commentarium De Certitudine Mathematicarum Disciplinarum." In: *In Mechanicas Quæstiones Aristotelis, paraphrasis paulo quidem plenior*. …, fol. 71r-110r (Rome: apud Antonium Blandum Asulanum, 1547). The popularity of the *Quaestiones mechanicæ* by pseudo-Aristotle in the first decades of the 16th century—then only recently canonized in the *Corpus Aristotelicum* published by the Aldine press in 1495-1497 or 8—exemplifies a more general interest generated among the men of letters of Padua for treatises in mechanics, hydrostatics, architecture etc. It certainly appears odd to us that the Italian *literati* would be interested to translate, let alone comment on technological matters, a non-liberal art, strictly speaking. But this is no more odd a fact than the inclusion of Aristotle's zoological treatises in the Arts curriculum (1521-4). A possible explanation is that, apart from these treatises offering untrodden ground for humanist inquiry, their subjects matters filled the gaps in a scale of Being from the more material to the more formal, or between the lowly element and the lofty prime mover. Cf. Valleriani, Matteo Valleriani, "The Transformation of Aristotle's Mechanical Questions; A Bridge between the Italian Renaissance Architects and Galileo's First New Science" *Annals of Science*, vol. 66; No 2 (2009); 183-208.

[158] As a plausible source of these sets of beliefs, Professor Longeway considers a 1510 commentary on the *Analytica Posteriora* by logician Antonius Coronel, indicative of the last flourishing in the University of Paris of the philosophical legacy of William Ockham and Jean Buridan Longeway, Josh Longeway, "The Place of Demonstratio Potissima in some 16th-Century Accounts of Mathematics," *Studia Artistarum* No 40 (2015): 223-251.

and Pietro Catena (1501-76). Barozzi, a Padua-educated mathematician and independent scholar, opposed Piccolomini's view in a lecture delivered at Padua in 1559, later to be printed as the first *Quæstio* of his *Opvscvlvm* (Padua, 1560), about the certitude of mathematics.[159] Along the same vein, Pietro Catena, professor of mathematics at the University of Padua, attempted to countenance Euclidean proofs within the model of Aristotelian demonstrative syllogism. Not long after, the dispute was carried over to the principal seat of the Jesuit order in Rome.

From his chair in the Collegio Romano, Pereira endorsed Piccolomini's critique in his *De communibus omnium rerum naturalium principijs & affectionibus* (Rome, 1562, 1576, 1585). The entire faculty of University of Coimbra took Pereira's side, while Cristopher Clavius (1538-1612) who taught mathematics at the Collegio Romano (est. 1551) would side with his friend Francesco Barozzi (1537-1604) and write "Nobilitas atque Præstantia Scientiarum Mathematicarum" in the *Prolegomena* to his edition of Euclid's *Elements*: *Commentaria in Euclidis Elementorum*, Libri XV …" (Coloniæ, 1574). In 1582 he circulated his "Modus quo Disciplinæ Mathematicæ in Scholis Societatis possent Promoveri," in praise of the educational value of mathematics. After decades of lively debate, the letter of the *ratio studiorum* of the Societas Iesu which was being drafted in the end of sixteenth century (privately printed in 1586, revised in 1591 and printed in its final form in 1599), came to endorse a mentality that was especially congenial to the methods of the abstract sciences. It was by the circulation of the *ratio* through the Jesuit educational nexus across Europe that it reached the *alma mater* of René Descartes, La Flèche.

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[159] Franciscus Barocius, "Quæstiones de Certitudine Mathematicarum," in *Opvscvlvm, in quo vna Oratio, & duæ Quæstiones: altera de certitudine, & altera de medietate Mathematicarum continentur.* 7r-33v (Padua: E.G.P., 1560),

As a matter of fact, the crux of the debate however remained relevant even way into the seventeenth century. The need to apologize for mathematics as a true science appears in the works of the most important mathematicians of the day across Oxbridge. John Wallis (1616-1703), appointed Savilian Professor of Geometry in Oxford (1649-1703) devoted the third chapter of his *Operum mathematicorvm* (1657) "How mathematics are confirmed to be true sciences."[160] Isaac Barrow (1630–1677), holding the first Lucasian Professorship of Mathematics in Cambridge (1663-1669), argued about the explanatory value of mathematics in the lectures at Cambridge in 1664-1666 (printed in Latin in 1683) as if still in conversation with Piccolomini's side.[161]

At stake in this debate was not only the hierarchy of the three speculative sciences in the curriculum of major institutions of learning—the *φυσική*, *μαθηματική*, *θεολογική* (*Met.* K7, 1064b ll. 2-3)—but also, by extension, the very status of mathematicians and natural philosophers in both academy and court.[162] In fact, Giovanni Crapulli[163] situates the *Commentarium* at the origin of the late sixteenth- and early seventeenth-century interest in the Proclean notion of *mathesis universalis* which would prove to be so critical for the Cartesian project.

The *Commentarium* is actually a good example of the kind of Aristotelianism brewing within such centers of Italian humanism as Padua, Venice, Pisa, Bologna, Pavia. Here we find

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[160] "Ch. III De Demonstrationibus Mathematicis. Unde Mathematicas uero Scientias eſſe confirmatur" in *Operum Mathematicorvm Pars Prima* (Oxford: Leon. Lichfield, 1657), I: 8-14.

[161] Isaac Barrow, *Lectiones, Habitæ in Scholis Publicis Academiæ Cantabrigienſis (1643)* (London: J. Playford, 1683).

[162] Mario Biagioli reminds us however that in England scholastic philosophy had already been declining from 1525-1575, and these problems did not emerge in the same manner or the same force as in the South of the Alps (Mario Biagioli, "The Social Status of Italian Mathematics, 1450-1600" *History of Science*, 27 [1989]: 41-95). Cf. Charles B. Schmitt. *John Case and Aristotelianism in Renaissance England* (Kingston [Ont]: McGill-Queen's University Press, 1983.

[163] Giovanni Crapulli, *Mathesis universalis. Genesi di Una idea Nel XVI secolo* (Roma: Edizioni dell' Ateneo 1969).

converged various strands of thought from the tradition of Aristotelian *exegesis*, dating as far back as late antiquity—from Ammonius (175-242 CE), to Alexander (fl. ca. 200 CE) and Eustathius (fl. 300 CE), Simplicius (ca. 480–560 CE), Philoponus (ca. 490-570 CE) and Themistius(317-ca. 388 CE)—and the High Middle Ages—Albertus Magnus (1200-1280 CE), Thomas Aquinas (1225-1274 CE) and Giles of Rome (1243-1316 CE). Based on the celebrated authority in mathematics, Proclus (412-485 CE), whose *Commentary on the First Book of the Elements* (Basel, 1533)[164] was only published in Greek for the first time some fourteen years prior to his essay, Piccolomini recovered the view that mathematics owes its exactness to its attenuated subject matter, not to some intrinsic virtue of its demonstrations; from Averroës he took the theory of accidentally quantified matter and the overall framing of the highest sort of demonstration;[165] from Aquinas he took the theory of *emanatio* and his metaphysics of natural action. So Piccolomini's essay encapsulates a panoramic view, in a typically humanist fashion, of hundreds of years' worth of developments in interpretation of the Stagirite.

If it is purely extrinsic relations that obtain between geometric subjects, unbound to anything substantial, their immateriality makes them certain as much as it also makes them unfit to account for any natural operation. Though the association of incertitude with sensible matter was nothing new in the Aristotelian tradition.[166] What is new here, implied by Piccolomini and explicitly stated by Pereira, is the view that mathematics, as a discipline that does not deal with any

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[164] Edited by Simon Grynaeus (Basel, 1533) "… using the first Latin translation made directly from the Greek by Bartolomeo Zamberti published in print in 1505, and two Greek manuscripts supplied by Lazarus Bayfius and Joannes Ruellius (Jean Ruel)" https://www.historyofinformation.com/detail.php?id=2362

[165] With Albert, for example, Piccolomini shared the view that a feature may be proven to belong to a substance only upon the supposition of conditions extrinsic to the definition of that substance;

[166] Aquinas too claimed that "quia incertitudo causatur propter transmutabilitatem materiæ sensibilis; unde quanto magis acceditur ad eam, tanto scientia est minus certa." (*PA* I.41.n3)." Also: "incertitudo causatur propter transmutabilitatem materiæ sensibilis; unde quanto magis acceditur ad eam, tanto scientia est minus certa" (*Comm. Met*. Lectio 41, Caput 29).

real natural causes, might not even qualify as a demonstrative science, in the strict Peripatetic sense. Piccolomini granted mathematics certainty as an undeniable intellectual experience in exchange for rendering it unfit to explain the inner-workings of nature. Ultimately, Piccolomini's side of the debate seems to suggest that an area of knowledge (such as the abstract study of natural motion that would soon yield important fruits in the works of Benedetti, Kepler, Stevin, Galileo, Beeckman, Descartes) would have less claim to be apodictically scientific to the degree it relied the more on *abstractible* affections and was less firmly grounded in the natures of things, even if it would compel assent in the non-negotiable way mathematical disciplines do.

II.2 The Locus Classicus of the Debate

Piccolomini was firmly convinced that, despite the occasional illustrations from geometry across his writings, it was the natural world the Philosopher reserved as the proper domain of the highest sort of demonstration; and since scientific knowledge is gained through these kinds of demonstrations and their concatenation, concrete and enmattered nature should be appreciated as the originally intended object of apodictic knowledge. Seemingly working against his intentions, however, he had the authority of the Andalusian polymath Averroës (Ibn Rušd, fl. 12th century), known as *the* Commentator-capital-C of Aristotle,[167] whose interpretation of the *De anima* had recently found renewed use in early 1500s among a group of Italian nature philosophers in Padua, led by Agostino Nifo (ca. 1473-1538/1545) and endorsed by Pope Leo X, which pitted Averroës' s interpretation against the rival interpretation of Alexander of Aphrodisias advanced in the ground-breaking work of Pietro Pomponazzi, *De immortalitate animæ* (Bologna, 1516) and its unpopular conclusions.

Aristotle held that a science [*ἐπιστήμη*] is more certain [*ἀκριβεστέρα*] and fundamental [*προτέρα*] by the degree it is less said of a *hypokeimenon*, that is to say, the subject matter is less determined and more simple [*ἡ μὴ καθ' ὑποκειμένου τῆς καθ' ὑποκειμένου* (*APo* I.27 87 ll. a31-36)], as arithmetic is more certain than harmonics; or to the degree geometry is derived from arithmetic by addition [*ἡ ἐξ ἐλαττόνων τῆς ἐκ προσθέσεως, οἷον γεωμετρίας ἀριθμητική* (*Ibid.*)[168]]. According to the exegesis of Averroës:

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[167] Woflson wrote that "by the fourteenth century Averroes came to be recognized as the commentator par excellence, and this reputation he continued to enjoy during the fifteenth century" H. A. Woflson "The twice-revealed Averroes" in *Studies in the History and Philosophy of Religion* (Cambridge: Harvard University Press, 1973) I: 383.

[168] cf. Aquinas, *Comm. In An. Post*. lect. 41, Ch. 28 (87 a31-b17).

Demonstrationes enim Mathematicæ sunt in primo ordine certitudinis: & demonstrationes Naturales consequuntur eas in hoc Certitudo enim diversat in eadem scientiam verbi gratia secundum demonstratione simpliciter, & secundum demonstrationem quia. &, cum diversat in eadem scientia, magis diversat in scientiis diversis secundum genus. Deinde declaravit in quo genere debet hominem quarere certitudinem, quod est in primo ordine.	[M]athematical demonstrations are in first order of certainty [*in primo ordine certitudinis*] and natural demonstrations come after them in this. For there are different degrees of certainty under the same science, that is, between demonstration *simpliciter* and demonstration *quia*; and since, if certainty varies under the same science, so much the more should it vary across sciences of separate genera. This is where Aristotle indicated in what genus ought man seek certainty, that is, of the first degree.

Metaphysicorum Libri XIIII, in *Aristotelis Opera cum Averrois Commentariis …* (Venice: apud Iunctas, 1552), VIII: fol. 35v.

As Piccolomini reports, a whole line of important Latin interpreters—from Albert, Thomas, Marsilius of Padua andc Giles of Rome, to the more recent ones, Zimmara, Suessanus, Acciaiolus—had all understood these lines (and quite justifiably so, we should add) as Averroës endorsing mathematics as the domain of the *demonstratio potissima*, and the paradigmatic sort of apodictic science. At the same time, however, in his *Proœmium* to the *Physica*, already available in print in Latin as of the end of fifteenth century (1472-5, 1483, 1495-7), where Averroës recapitulated the threefold division of theoretical sciences into *mathematica*, *naturalis*, & *divina*, he presented a mathematics that is meant for practice [*propter exercitium*; *ad usum*] and in the service of perfecting natural philosophy and theology [*propter perfectionem*].[169] What is more, Aristotle had cautioned that such a degree of exactness as attained in mathematics should only be sought after in immaterial subjects; and since all nature, most likely, has *ὕλη*, the way of the

[169] "*…propter perfectionem, propter quam ipsum exercitium est*; *inter ipsas perfectiones connumerant ob quas, scilicet fit ipse usus*"
[Averroës, *In Libros Physicorum Aristotelis Proœmium*, in *Aristotelis Omnia* (1550), IV: fol. 3r ll. a50-56 (antiqua translatio) and b49-56 (mantini translatio)].

mathematician can not be the way of the natural philosopher (*Met*. a.3, 995 a14-17)]. So, being merely abstractions devoid of matter, mathematical *εἴδη* are neither subsistent nor as causally meaningful as the concrete individuals that set our abstractive faculties to work in the first place.

Now, since Piccolomini granted certainty in mathematical disciplines as an undeniable intellectual experience,[170] he felt the need to renegotiate the source of their exactness, all the while without doing injustice to the long-lasting authority of Averroës. To do so, he meant *to dis-engage demonstrative potency—the* potissima *factor—from mathematical certainty*, so that a discipline could claim more *potestas* to the degree it was less abstract and more firmly grounded in the nature of things, even if it would not compel assent in the non-negotiable way mathematical disciplines do. He had to offer *a deflationary account of the certainty obtained in mathematical reasoning against the world-directedness of natural philosophy*. If indeed the authority of Aristotle could be shown to have meant *scientia*, in its full-blooded sense, was to be gleaned from and directed to the world of particular substances, natural history could still hold some promise to an eventual ascent to the first principles of *scientia*, and there would be hope that an apodictic science of nature was within reach.

[170] Proclus referred to the *ἀναγκαῖον* of mathematics. Averroës paraphrases the Greek *ἀκριβολογία ἡ μαθηματική*, translated as *perscrutatio in Mathematicis* by Michael Scot, and *certitudino sermonis mathematicam* by Johannes Bessarion; but Averroēs paraphrases it as *modus fidei in demonstrationibus Mathematicis*, trans. from Arabic by Michael Scot (most probably).

II.3 The Argument of the Commentarium

The overarching argument of the *Commentarium* is that there are crucial features present in the causal framework of the physical world, whose absence in mathematics undermines any claims to its being the highest sort of demonstrative reason. If mathematical reasoning is to track some genuine and scientifically meaningful relations among in its subject, they must belong to one or another of the four kinds of causality outlined in book II of the *Physica* and book Delta of the *Metaphysica*, as collectively exhaustive of all possible forms of causality. Now, (1) efficient causation obviously does not enter in mathematical demonstrations, since a mathematician deals with motion only metaphorically [*metaphorice*] and the affections s/he studies cannot flow from an external cause [*passiones mathematicæ non possunt fluere ex causa extrinseca*]; and neither does (2) final causation, since the only forms of the good to obtain in mathematics are extrinsic to it [*bonum in Mathematicis deforis advenit*]. Insofar as (3) material causation is concerned: it is true that howsoever much mathematics abstract from sensible matter, they do not abstract from intelligible matter [*quamuis abstrahant a materia sensibili, non tamen ab intelligibili* (Averroës, *Met*. Z.34)]; but intelligible matter is quantity itself as located in the imagination [*materia autem intelligibilis, quantitas ipsa est, in phantasia collocata*]; while all the parts of the definition are called forms (Averr. *Phys*. II.28). So, the only way mathematics imports matter is in a broad sense, as the less perfect bears the role of matter—*rationem materiæ habere*—in relation to the more perfect, only in sequence—*respectu sequentis* (*De Cert.* fol. 103v). So what is left of the four Aristotelian causes comes down to the most critical one: (4) formal causation.

So far, the process of elimination agrees with the *Proœmium* of the Commentator, who claimed that, though natural philosophy considers all four causes, and theology considers three

out of four, mathematics considers only formal causes.[171] It is only after restricting the causal resources available to mathematical demonstrations down to the formal, that Piccolomini finally mounts his more elaborate argument in chapter XI of the *Commentarium*. There are three main syllogisms that reach the same conclusion, all three of which are cast in *Camestres*, including their nested sub-syllogisms (see Appendix). This means they all argue from some feature excluded from the minor term, to wit, mathematics, to the exclusion of another feature as implied by the major.

Any reader of the *Analytica posteriora* would concede that within the model of the *ἐπιστήμη ἀποδεικτική* a formal cause is expected to be: [A] *definitive* of the effect (*APo* I.8; II.2); [B] prior to being and to knowledge of the same effect and also *proper*, *immediate* and *convertible* with it (*APo* I.2, *De Cert*.); [C] ultimately expressed by a *unique* middle term that attaches to the nature of the major term (expressing the effect) or the minor term (expressing the subject). Accordingly, the first argument, A, is from the report of mathematical demonstrations that employ immediate yet not definitional premises, to their exclusion from the *potissima*. Similarly, the second syllogism, B, argues for the same conclusion from the lack of causally meaningful relations in mathematical demonstrations. Finally, the third syllogism, C, argues from the multiplicity of middles applicable in mathematical demonstrations to their exclusion from the highest sort [see argument outline on Appendix I].

[171] Still, when Buridan or Coronel referred to the strictly necessary relations pertaining to mathematical demonstrations as formal, it was to be taken in a broader sense, for lack of a better fit under the rubric of any other cause.

II.4 Geometrical Exposition

If recast in geometric form, i.e. from the more fundamental to the more derivative [or from the more intelligible *per se* to the more intelligible *ad nos*], as done in that time for the purpose of instruction in the Arts, the argument would take the following form:

1. *All action is due to a substantial form* [*ad hoc ut aliquod subiectum agat, necesse est vt forma præditum sit substantiali*] for **[a]** all action is by a formal principle introduced in prime matter [*cum omnis actio sit ratione formæ introductæ in prima materia*], and **[b]** prime matter as such, does not do anything [*quia materia prima quatenus talis, nihil agit*]

We find this statement across all Aristotelian textbooks, and anyone who claimed to be a Peripatetic, howsoever remotely, would concede to it. It goes back to Aquinas who claimed: "… every agent acts by its form. Hence the manner in which it has its form is the manner in which it is an agent. Therefore, whatever is primarily and essentially an agent must be primarily and essentially form" (*ST* Ia.Q3.A2); "[n]o action belongs to anything except through some principle formally inherent in it" [*Nulla autem actio convenit alicui rei, nisi per aliquod principium formaliter ei inhaerens* (Q79.A4, co 3)]; and that "… the heat in the fire follows from its substantial form [*calor in igne consequatur formam substantialem*]" (Q5.A4, c 2). This view however is based on an even more fundamental axiom that was presented in the *Summa* that makes his units of being the only real agents: "to act *per se* belongs to what exists *per se* (Q75.A2, arg 2)." Or, consider this passage:

> [O]nly that which subsists can have an operation *per se*. For nothing can operate except a being in act; hence, a thing operates as it is [*potest per se operari nisi quod per se subsistit; non enim est operari nisi entis in actu, unde eo modo aliquid operatur quo est*] For this reason we do not say that heat imparts heat, but that what is hot gives heat (Q75.A2, co2);

In other words, when seeking to localize the real subject of a certain action or opera-

tion—say the human affections of anger, sleeping, or of a distemperment—those actions or passions should be attributed to such level of analysis of the given subject as the level it is said to subsist in. This is exactly why, in the metaphysical profile of the fire, Chapter I, we claimed it is "fire or the hot *thing* that imparts heat," properly speaking, not that "hot gives heat." If **(c)** whatever acts must exist, and since **(d)** whatever exists does so in virtue of a substantial form as its first and principal act, all other acts must proceed from substantial forms. From the point of view of a physics where "everything is said like the snub," he will hold that *what* is hot is not his skin, properly speaking, nor the surrounding air that committed that exchange but rather the whole fire-substratum.[172]

2. *Substantial forms subscribe to their own proper affections.* For by the account of Averroës on *De Cælo* III, **[a]** if form is given, its proper accidents follow up to it closely as its consequences; **[b]** actions emanate from subjects by the mediation of proper accidents [*ad quam formam, quia dans illam ... dat omnia ad eam consequentia, sequuntur statim illa accidentia, quæ sibi conueniunt: quibus omnibus mediantibus, a subiecto ipso, actiones ipsæ emanabunt*].

This is essentially the inverse direction of the previous statement [1] that makes all actions consequent on substantial forms. So here Piccolomini argues that insofar as something determinate exists, it must act or behave in a particular manner as a matter of natural sequence, i.e. the action of heating emanates from fire [subject] by the mediation of heat [proper accident] which serves as what Aquinas calls the *principium formale* of an operation or a form of action. It originates in contrapositive form in *De Anima*, where it is claimed that "if the soul does not have a proper act that if the soul does not have any proper form of action or passion in itself it cannot

[172] "[T]he first perfection of fire consists in its existence, which it has through its own substantial form; its secondary perfection consists in heat, lightness and dryness, and the like; its third perfection is to rest in its own place [*Utpote prima perfectio ignis consistit in esse, quod habet per suam formam substantialem, secunda vero eius perfectio consistit in caliditate, levitate et siccitate, et huiusmodi, tertia vero perfectio eius est secundum quod in loco suo quiescit*]" (*ST* Ia Q6.A3, c).

subsist separately [*εἰ μὲν οὖν ἔστι τι τῶν τῆς ψυχῆς ἔργων ἢ παθημάτων ἴδιον, ἐνδέχοιτ' ἂν αὐτὴν χωρίζεσθαι* (*De Anima* I, 403a 10-11)]. Thomas raised this into the principle that links the whole and proper subjects of activity with subsistence, so that the ability to function as the complete and *per se* subject of certain actions and passion is a sign for their subsistence. Fracastoro too references the same principle in his *Turrius, sive De Anima*, in: *Opera Omnia*, fol. 215v C-D: "ſi oſtendero operationem quandam in homine eſſe, in qua nihil communicet corpus, ſed propria animi ſit, proculdubio conſitendum erit naturam animi ſeiunctam per ſe, & abſtractam eſſe à corpore."

3. Substantial forms ascribe to their own passions, by a certain natural order that is very often unknown to us [*Quælibet ergo forma substantialis, sibi suas passiones ascribit, & illas quodam naturæ ordine nobis nimis sæpe ignotas*]. For **[a]** *an order of priority* [ordo prioritatis] *can only be found in affections 'flowing' from their subjects*. For, **[b]** given first the *fluxus* of anything [*primum datur huiusmodi fluxus*], there is also given an order of natural priority [*ordo prioritatis naturae*].

To flow from a subject means that there is an inherent active potential [*principia activa*] that is 'called to action' every time the corresponding passive circumstances obtain. In *this Thomist theory of* emanatio*, or* dimanatio, an effect follows upon the nature of the subject *as a matter of natural consequence, in the same way color flows from light* (Aquinas *ST* Ia.Q77.A6, ad 3) or the manner in which the water defaults at cold temperature by its own nature (Suárez, *Disputatio* XVIII, Sectio III). [173]

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[173] Francis Bacon also claimed that: "The schools termed this natural motion, by a superficial consideration of it, because produced by no external visible agent, which made them consider it innate in the substances; or perhaps because it does not cease, which is little to be wondered at, since heaven and earth are always present, whilst the causes and sources of many other motions are sometimes absent and sometimes present. They therefore called this perpetual and proper, because it is never interrupted, but instantly takes place when the others are interrupted, and they called the others adscititious" [*Hunc Schola nomine* Môtus Naturalis *inſigniuit; leui contemplatione, quia ſcilicèt nil ſpectabile erat ab extrà, quod eum Motum cieret: (Itaque Rebus ipſis innatum atque inſitum putauit:) Aut fortè quia non ceſat. Nec mirum: Semper enim præstò ſunt Cœlum & Terra; cùm è contrà cauſæ & origines plurimorum ex reliquis Motibus interdùm abſint, interdum adſint. Itaque hunc, quia non intermittit, ſed cæteris intermittentibus ſtatim occurrit, Perpetuum & Proprium; reliquos, Aſcititios poſuit.*] (*NO* II: 316; 48, 7)].

This is based on the rather strong intuition that the natural procession of causes and effects is unidirectional. Though one sort of events can be logically convertible with another, say fire and smoke, only one is the real or true cause of the other, i.e. fire. In other words, there is an asymmetrical relation between terms that explain one another which differentiates physical subjects from any other subjects of predication. This is after all what motivates Piccolomini to adopt the Commentator's threefold division of demonstration into the *quia* (of the fact that), *propter quid* (for the reason why), and *simpliciter* or *causa & esse* (of cause and Being). A nominalist like Coronel would only accept the two traditional stages of inquiry into *hoti* and *dioti*, and take a conjunction of demonstration *propter quid* with demonstration *quia*, to be no less incoherent than one saying both that he simply believes *P*, and that he also knows that *P*. In other words, one cognitive stage supersedes the other in the order of learning.

But Piccolomini maintains that once the inquirer grasps both the fact and the reason, their combination brings out something more than its mere parts because it, namely, how one is ordered to the other. So, for example, once I realize that the stars are far away from the fact that I see them twinkling, I would also need to establish an order of natural priority between them. For, though fairly obvious in the particular example, given the nature of a perception that operates on sensible species transmitted by those celestial bodies, I realize that the twinkling is *a sign for* their distance, and a manifest effect of some prior unmanifest reality, rather than the other way around; in the same way a manifest symptom is a sign for some disease, or snub nose is a sign for the phlegmatic disposition, arguing from effects to causes, until we demarcate the real *per se* subject of these affections and close the distance between them by an order of middle terms.

In other words, the regular course of nature is not articulated only by immediately related

and convertible universals—say, leaf-shedding and broad-leaved trees—but there is an *ordo proprietatis*, an actual order of nature from substance to its proper actions, that makes the regressive return [*regressus*] to the original fact scientifically meaningful [§ *The Order of Ad Nos and Naturæ*].

4. *All affections found in their subjects in a particular order of priority* [ordo prioritatis] *are explained through unique middle terms*. "… given first the *fluxus* of anything [*primum datur huiusmodi fluxus*], there is also given the order of natural priority [*ordo prioritatis naturae*], because a single thing, insofar as it is one, cannot produce immediately but one, [*unum inquantum unum, non potest immediate producere nisi unum*] as shown in many places across Aristotle.

Piccolomini refer us to the authority of Aristotle who claimed in *APo* II, that, though there can be many causes to any given effect only one will be the proper, immediate and convertible cause [*una tanquam* <causa> *sola erit propria & immediata & convertabilis* (*De Cert*. ch. XI, fol. 104r)]. Consider this passage from Averroës *Destructio* (Venice, 1562) which, by the time of Piccolomini's treatise was already published in multiple editions some of which commented by Augustino Nifo: "[A]ctio & paſſio vna inter quælibet duo entia ex entibus eſt propter aliquā re | lationem relationum infinitarum" (IX: fol. 129v M13-130r A1).

5. *Quantity is prior to substantial form.* For: **(b)** It is from the nature of a form that quantity acquires a limit, because **(c)** different forms of things, claim different limits of quantity for themselves … [*Quamuis enim quantitas, si termino quodam illam constringimus, id ex formæ natura sortiatur, quia aliæ rerum formae, alios quantitatis terminos sibi vendicant: ...*] **(d)** However, upon removing all of its limits, quantity cannot be ascribed to any substantial form [*secluso omni termino, nulli addicta est formæ substantiali*].

Most Aristotelians would ascribe to the view that **(a)** *substantial forms are not intrinsically dimensified*, which simply means the influence of a substance imposes limits in matter already quantified, or as Thomas used to put, matter signated by indeterminate dimensions [*materia sig-*

nata sub determinatis dimensionibus existens (*In ver.* Q X, a. 5)].[174] In the analysis of an *ousia* into sensible matter and its principal form of activity, a natural being occupies some space, its internal place, and its relative position to others, its external place, through its material part. But if **[c:]** it is the form that variously delimits body and introduces the dimensions proper to each thing, prior to its introduction in matter, quantity must be without limits, or as described by Averroēs and then Aquinas etc, *sub dimensionibus interminabilis*. But **[e]** all quantity under any denomination belongs to an accident in the scheme of the *Prædicamenta*, and no accident can subsist on its own. In fact, if the subject in which it subsists is actually existing, natural substances would be composed of two things in actuality, and the only manner two actually existing things can combine is *per accidens*. Being nothing on the side of the actual, prime matter underlies quantity but constitutes a unity with the substantial form. Overall then, **[g:]** quantity can neither be a substantial form, nor be an affection flowing from a substantial form. So, lest all beings in nature be forms accidentally attached to this space or this body:

6. Quantity, insofar as [5:] it is indeterminate and a nature prior to any substantial form, is coeternal with prime matter [*quia quantitas est illi coæterna, interminata tamen, ac prior natura est omni forma substantiali*, (*De Cert.* fol. 106r)]. Which means that the corporeal form among legitimate Peripatetics *is indeterminate quantity in prime matter* [*in materià prima quantitas interminata*].

7. If, by **4(c)** no actuated matter being is assigned to it, but follows upon its being enformed, it will not be listed among other active potentials or *ratio agendi* [*cum sit imperfectissimum accidens, nullamque sibi actuatam ascribat materiam, sed informem illam sequatur, inter actiuas potentias, siue inter rationes agendi, non connumerabitur*] AND *Quantity does not concern active potentials* [*quantitas non est de principiis activis*] as reported by Aver. in *Comm*. *Phys* IV, 84.

8. Mathematical affections cannot have such an order or procession, or a flow from the subject, because quantity is not about active principles [*passiones mathematicæ non possunt*

[174] "materia signata," or "materia subjecta dimensioni" (*In Boeth. de Trin*., Q. IV, a. 2), "materia sub certis dimensionibus" (*De Nat. Mat*., iii).

habere talem ordinem vel processum, sive fluxum a subiecto, quia quantitas non est de principiis activis], as reported by Aver. in *Comm. Phys* IV, 84.

So, if indeterminate quantity prior to substantial form is not sustained by any determinate subject, whatever affections pertain to the subject matter of mathematics, they are not expected to relate to one another in any unique *ordo prioritatis*. Finally, the fact that the immediacy of the premises that compels our assent in mathematical demonstrations is symmetrical, and that each term gets an equal claim as the *logical* cause of another, is a sign that there are no active principles, or substantial forms to fix a particular *ordo prioritatis* from substances to affects, and causes to effects.

9. And thus the same mathematical affections are found to be proved of their subjects by various equally legitimate middle terms indeed.

Since there is no substantial form to command its proper affections as a matter of a certain natural consequence, it is not necessary for subjects in quantity to have unique and convertible middle terms. And indeed, as evinced in various geometric theorems, there can be found multiple and equally valid middle terms for proving the same quality of the same subject, even extrinsic ones, just as much as there can be used common notions in demonstrations.

In conclusion then, the most crucial requirement of scientific demonstration, that it offer

premises that are prior, causal, immediate and convertible with the effect cannot be met.[175]

[175] Of interest is the fact that one of the latest apologetics for the certainty of mathematics in the Aristotelian framework, Isaac Barrow, as if still in conversation with Piccolomini, downplayed efficient and final causality in order to show mathematics demonstrate from the higher and most certain of causes, i.e. formal causes. He did not embrace the relational and constructional nature of mathematical demonstrations, but, in order to defend it against a Peripatetic audience whose criticisms extended as far back as Pererius and Piccolomini, he framed them as *per se in subjecto*, while for the charge of employing middle terms that are extrinsic to the subjects of geometric demonstration, he allowed the *via resolutiva*, to implicate different subjects in the particular syllogisms as long as they mediate in the connection of the major term to the minor, i.e. the primary subject of the entire theorem that is compounded of many distinct syllogistic steps. ... To the charge of no order or hierarchy he allowed multiple middles and ways of definition that do not hurt the certainty of mathematical sciences. The way he normalized multiple definitions of the same entity, is through multiple causal explanations through facts of generation, i.e. genetic definitions. For instance, a circle may be created by a rotating line around one of its points considered immovable as much as it can from a cone being cut by a surface that is orthogonal to its axis. So, contrary to the usual stress placed on efficient causality in early modern natural philosophies, it should be said that way into the 17th century, it was the formal cause that was associated with certainty and this is exactly how Bacon supressed any efficient or material causes to reveal the immediate formal causes as *Actus Purus*. For, efficient causality that governed the praeternatural interactions of bodies (extrinsic) or a substance's interaction with the environment *via emanatio* (intrinsic) contained features of matter that could not be reduced to form, i.e. impenetrability, cohesion, inertial forces.

II.5 Truth over Certainty

Astronomy, more so than any other discipline expressed the tension between these two approaches, simply because the heavens were such that could be studied in principle both by physics (as sensible phenomena about concrete bodies) and mathematics (insofar as their orbits can be studied besides the dynamics of the stuff they were made of, the aether). In these two aspects, astronomy exemplifies best the difference between studying attributes *qua* separable or *qua* inseparable.

In that scale of perfection, mathematics seemed to occupy a precarious position. Ordered between *φυσικὴ* and the *θεολογική*, the *ἐπιστήμη μαθηματικὴ* dealt with unchangeable [*ἀκίνητα*] but non-self-subsistent things [*οὐ χωριστὰ δ' ἴσως, ἀλλ' ὡς ἐν ὕλῃ*] according to the classic division of theoretical sciences from *Met*. Epsilon 1 1026a 13. In other words, the subjects of mathematics were unchangeable as much as they were insubstantial. In fact, the principal mathematical sciences, arithmetic and geometry, did not really study *οὐσίαι* but accidents or *εἴδη* under the category of quantity (*APo* I 79a, *Met*. Λambda 8 1073b). So if the various cases of mixed mathematics take up enmattered subjects, they do so by abstraction and *per accidens,* only insofar as they can be considered separated from their matter [*οὐ κεχωρισμένα, ὡς κεχωρισμένα*].

Either considered as different from natural philosophy or as a part of it, astronomy held a special place in that division insofar as it was believed to study the affections of *οὐσίαι* that are both sensible and eternal. To the degree that quantity is an accidental form common to both physical and celestial things (as Ptolemeus had put it in the *Almagest*) they can afford some level of certainty, but to the degree these are determinations of real substances their true natures and the actions emanating from them are unknown or outright occult.

> … if we consider motion in common, abstracted from matter, insofar as it is something continuous, just like Aristotle does in *Phys*.6, then it will be a mathematical issue, and not against us. But if motion [be studied] insofar as it is in the celestial body, or in the animal, or in any other limited manner, then, since it arises and flows from the proper principles and delimits a proper matter by itself, it renders knowledge arduous and difficult [*si autem quatenus vel est motus in corpore coelesti, vel in animali, vel alio quouis modo limitato: tunc cum oriatur & fluat ex principiis propriis, & materiam sibi propriam limitet, cognitionem reddet arduam & difficilem*].

To really grasp the order of nobility between these theoretical sciences, *mathematica*, *naturalis* & *divina*, we need to turn to a different passage. The order of certainty among sciences, according as they are less material, is complemented by an order of nobility according as its subject matter is more noble [*τὴν τιμιωτάτην δεῖ περὶ τὸ τιμιώτατον γένος εἶναι*, (*Met*. E 1)]. In *Metaphysica* a 1 993b, Aristotle shows that, if (a) the goal of theoretical science is truth for its own sake [*ἀλήθεια*]. But in a causational understanding of truth, like the Peripatetic one, we know truth through the cause [*οὐκ ἴσμεν δὲ τὸ ἀληθὲς ἄνευ τῆς αἰτίας*]. Now, if (c) something is considered more true to the degree that it renders other things true [*ἀληθέστατον τὸ τοῖς ὑστέροις αἴτιον τοῦ ἀληθέσιν εἶναι*] in the same way fire is hotter than what it transmits its heat to; then (d) the principles of eternal beings [*τὰς τῶν ἀεὶ ὄντων ἀρχὰς*] if they are indeed uncaused themselves and give cause to all others must be the most true [*ἀληθεστάτας*]. So generally, something is more true, and its study presumably more noble, to the degree it is more causally independent and has more being [*ὥσθ' ἕκαστον ὡς ἔχει τοῦ εἶναι, οὕτω καὶ τῆς ἀληθείας*]. It is important to remember then that the canonical texts support the claim that theoretical value is proportionate to the place an entity holds in the natural order of causes, not the degree of certainty it can invoke. A science *ἀκριβεστέρα* is not necessarily *ἀληθεστέρα* if it does not regard *real* causes.

Similarly, though Aquinas made certitude one of the two determinants of a dignity of a

given speculative science: "Certitudo enim pertinet ad dignitatem scientiae" (*ST* Ia.Q1.A5, obj 1); "Speculativarum enim scientiarum una altera dignior dicitur, tum propter certitudinem, tum propter dignitatem materiae" (Q1.A5, co 1). These two statements however must be combined with the following *Response to the first objection* (ad 1), that makes the dignity of the subject matter more valuable than certainty:

> Et tamen minimum quod potest haberi de cognitione rerum altissimarum, desiderabilius est quam certissima cognitio quæ habetur de minimis rebus, ut dicitur in XI de animalibus.

In a different passage, he holds that separate substances are naturally immaterial (i.e. their subsistance does not require matter) which makes them most certain in the order of nature [*secundum seipsa certissima*] even though they do not appear so in regards to us, *certa nobis,* because they exceed our intellect. By contrast, mathematical beings abstracted out of matter manifest most certain and demonstrable relations to our intellects because they do not exceed it.[176] This is basically equivalent to claiming it is preferable to attend to causally active and self-subsisting beings even if they afford less certainty, than to model scientific demonstration on such a strong demand for certainty at the price of studying things that are inactive and non-self-subsisting. On that matter, Roger Ariew confirms that:

> Aristotle's doctrine is complex and open to interpretation on such topics, but Thomistic interpretations of Aristotle—what the Jesuits were generally committed to—are more rigid about such matters. Thomas holds that mathematicians abstract from sensible matter and motion (*Commentary on the Metaphysics* V, lect. 16, n. 989, and elsewhere) and that

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[176] "[D]icens quod acribologia idest diligens et certa ratio, sicut est in mathematicis, non debet requiri in omnibus rebus, de quibus sunt scientiae; sed debet solum requiri in his, quæ non habent materiam. Ea enim quæ habent materiam, subiecta sunt motui et variationi: et ideo non potest in eis omnibus omnimoda certitudo haberi. Quaeritur enim in eis non quid semper sit et ex necessitate; sed quid sit ut in pluribus. ¶ Immaterialia vero secundum seipsa sunt certissima, quia sunt immobilia. Sed illa quæ in sui natura sunt immaterialia, non sunt certa nobis propter defectum intellectus nostri, ut praedictum est. Huiusmodi autem sunt substantiæ separatae. Sed mathematica sunt abstracta a materia, et tamen non sunt excedentia intellectum nostrum: et ideo in eis est requirenda certissima ratio" (*Comm. Met*. a, Lesson 5, No 336).

the mathematical sciences prove the same conclusions as the naturalists by formally different principles of demonstration (*Summa Theologiae* lla.llae, q. 1, art. 1). This is consistent with Thomas's discussion of the subalternate sciences: in the mathematical sciences, the geometer explains the reason why according to the formal cause, but the quantitative form is a remote cause as far as the natural phenomenon is concerned (*Commentary on the Posterior Analytics* I, chap. 13). For Thomas, mathematics and the mathematical sciences are subalternated to natural philosophy. Mathematics looks to natural philosophy for itsjustification.[177]

In a preface to Copernicus's *de revolutionibus* that introduces the scope and value of the Copernican hypothesis to the reader, Andreas Osiander (1498-1552) famously claimed that certainty, comprehensability and computational facility as scientific critiria are distinct from truth conditions:

> … For it is the duty of an astronomer to compose the history of the celestial motions through careful and expert study [*diligenti & artificioſa obſeruatione*]. Then he must conceive and devise the causes of these motions or hypotheses about them. Since he cannot in any way attain to the true causes, he will adopt whatever suppositions enable the motions to be computed correctly from the principles of geometry for the future as well as for the past [*Est enim Astronomi proprium, hiſtoriam motuum cœleſtium diligenti & artificioſa obseruatione colligere. Deinde cauſas earundem, ſeu hypotheſes, cum ueras aſſequi nulla ratione poſſit, qualeſcunque excogitare & confingere, quibus ſuppoſitis, ijdem motus, ex Geometriæ principijs, tam in futurum, quàm in præteritum recte poſſint calculari*].
>
> The present author has performed both these duties excellently. For these hypotheses need not be true nor even probable. On the contrary, if they provide a mode of calculation consistent with the observations, that alone is enough [*Neque enim neceſſe est, eas hypotheſes eſſe ueras, imò ne ueri ſimiles quidem, ſed ſufficit hoc unum, ſi calculum obſeruationibus congruentem exhibeant*].
>
> … In this science there are some other no less important absurdities, which need not be set forth at the moment. For this art, it is quite clear, is completely and absolutely ignorant of the causes of the apparent nonuniform motions. And if any causes are devised by the imagination, as indeed very many are, they are not put forward to convince anyone that they are true, but merely to provide a reliable basis for computation [*Sunt & alia in hac diſciplina non minus abſurda, quæ in præſentiarum excutere, nihil eſt neceſſe. Satis enim patet, apparentium inæqualium motuum cauſas, hanc artem penitus & ſimpliciter ignorare. Et ſi quas fingendo excogitat, ut certe quamplurimas excogitat, nequaquam tamen in hoc excogitat, ut ita eſſe cuiquam perſuadeat, ſed tantum, ut calculum recte in-*

[177] Roger Ariew, *Descartes and the last Scholastics*, p. 191, [n. 10].

ſtituant].

> However, since different hypotheses are sometimes offered for one and the same motion … the astronomer will take as his first choice that hypothesis which is the easiest to grasp. The philosopher will perhaps rather seek some likely story. But neither of them will understand or state anything certain, unless it has been divinely revealed to him [*Cum autem unus & eiuſdem motus, uarie interdum hypotheſes ſeſe offerant ... Aſtronomus eam potiſsimum arripiet, quæ compræhenſu ſit quàm facillima. Philosophus fortaſse, ueri ſimilitudinum magis requiret, neuter tamen quicquam certi compræhendet, aut tradet, niſi divinitus illi reuelatum fuerit*]. [178]

Similitudo veri is actually the wording by which Cicero (*Timæus* 29, c1 15) rendered Plato's *εἰκὼς λόγος* or *μῦθος* [*cum autem ingressa est imitata et efficta simulacra, bene agi putate si similitudinem veri consequatur*] (among also *probabilia and coniectura* in *Tim*. 30b6). The astronomer is contrasted to the philosopher as someone who values how much easier the hypotheses are to grasp, rather than demanding a semblance of the truth. The facility in comprehension here is contrasted as a goal with the semblance of truth (or that *calculum recte instituant ita esse*). What this similitude to truth could have meant for the Renaissance reader is that an account of a changeable natural world, can only be provisional and to a certain degree fictional.

In a very interesting work of Piccolomini's published some twenty years after the *De revolutionibus* (and fifteen after the *Commentarium*) this time in plain Italian, we find an even more explicit expression of that epistemic division of labour between the natural philosopher and the mathematician. In response to those that judge astronomical hypotheses on whether they are worthy of the Artificer that produced them, Piccolomini insists that their possibility or impossibility does not concern astronomy and does not correspond to the astronomers' intention which is merely "… to find some way to save, if possible, the appearances of the planets, together with

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[178] Nicolaus Copernicus, *De Revolutionibus Orbitum Cœlestium, Libri VI* (Nuremberg: Ioah. Petreium, 1543), Ad Lectorem, i.-ii. Translated in *Nicolaus Copernicus, On the Revolutions*, trans. Edward Rosen. (Baltimore, MD: Johns Hopkins University press, 1992).

the ability to calculate them, compute them, and predict them from time to time."[179] In fact:

> … [It] is more than enough for the aforesaid astrologers that their representations be able to save for them the appearances among the celestial bodies so that they can compute their motions, positions, and places, whether such representations be true or not true, provided that they succeed in saving the appearances. The other considerations, in which they have little interest, they have left to the natural philosophers. For it is not hidden to them that just as with logicians there can through force of inference arise a conclusion from false premises, so an effect can be inferred and deduced from a pretended cause. … [B]y analogy suppose that we should see a stone strike a wall and with great force, and not knowing the origin of such fury we should imagine that the stone had come from a bow or a crossbow. And suppose that our representation were false and that as chance would have it the stone had come from a sling shot. Nevertheless it would have struck the wall with the same fury if it had come from the imagined bow. For the aforesaid fury of that stone could have derived from more than one cause.[180]

This special status of mathematical *εἴδη* also explains why, against the prerequisite of *scientia* for univocal, or one-to-one causal explanations, there can actually be multiple explanations about the same fact. It is exactly because mathematical properties often do not belong *per se* to the subjects they are demonstrated to belong to necessarily, that many proofs of the same theorem are equally valid. The fact that they are not the results of a particular natural action allows them to alternate between hypotheses, postulates and constructions in saving the phenomena by equally valid demonstrations. Drawing from the view expounded in the *Commentarium de certitudine*, it is exactly because the relations pertaining to constructions and their properties in intelligible matter are extrinsic to their terms and imposed by the geometer's will that the same affection can be shown to belong to the same subject in multiple ways,[181] or in contemporary terms,

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[179] Alessandro Piccolomini, *La Prima Parte delle Theoriche, o vero Speculationi de i Pianeti* (Venice: Giouanni Varisco & Paganino Paganini, 1558) Lib. I, Cap. X, pg. 22-25. As translated in Rufus Suter "The Scientific Work of Alessandro Piccolomini" *Isis* 60, No. 2 (Summer 1969): 210-222.

[180] Alessandro Piccolomini, *La Prima Parte delle Theoriche, o vero Speculationi de i Pianeti* (Venice: Giouanni Varisco & Paganino Paganini, 1558) Lib. I, Cap. X, pg. 22-25. As translated in Rufus Suter "The Scientific Work of Alessandro Piccolomini" *Isis* 60, No. 2 (Summer 1969): 210-222.

[181] In fact, by the contrapositive of the Aristotelian axiom that: *a single thing, insofar as it is one, cannot produce immediately but one* and the fact that *everything acts as it is*, we can suppose that mathematical beings should not even be considered as unities properly speaking.

that there can be multiple *models* of explanation for the same set of appearances. Equally, the same celestial phenomenon—reliably repeatable presumably due to the purity of the stuff the heavens are made of—could be saved through multiple models, none of which aims to disclose their real physical causes which were after all considered occult,—anymore than, in Piccolomini's illustration, computing the trajectory of a ball bouncing off a wall and describing it kinetically cares to settle whether that motion originates from a hand or a slingshot.

So, for example, the Copernican model of the heavens can compete with the Ptolemaic or the Tychonian on the basis of its simplicity, or facility in calculation, but whether the heavens revolve around a static earth or the earth revolves around the sun can only be settled by extra-mathematical considerations that deal with real efficient and final causes[182] that happen to be beyond human understanding or human reach. Insofar as the intentions of the heavenly spheres, as much as their influences, are occulted from us we can merely study their motions *in abstracto* (*qua* bodies in simple motion) in their overlap with geometry and not as part of natural philosophy (*qua* sensible active substances). For truth in the natural sciences follows the strictly causal understanding of *APo*, yet no mortal has ever been privy to the intentions of the intelligent movers of the spheres, let alone their extraphysical means of inspiring motion into bodies, the understanding of which would ultimately settle the one and only true sufficient reason.

Other important authors may be cited in passing who recapitulated the same point way into the seventeenth and early eigteenth century. We have for example Isaac Newton claiming in

[182] In fact, when in his *De Revolvtionibvs Orbium Cælestium* (Nuremberg, 1543), Copernicus appeals to the description of the sun as the 'lamp of the world' [*lucerna mundi*] or the 'ruler of the world '[*rector*, *mens mundi*] any function of which would be better dispensed from a central epoptic position or the economy of nature he oversteps the model-making office of the astronomer as famously outlined in Osiander's introduction and argues, however so rhetorically, about the reality of his model by final causation in the paradigm of the 'likely story' of *Timæus*, supposing that the divine will would have realized, out of an infinity of possible worlds, that which made more sense, or is more marvellous, economical etc.

his famous scholium that he means only: "only to give a mathematical notion of those forces, without considering their physical causes and seats.[183] Similarly we find Leibniz saying: I wouldn't want to claim on these grounds that these mathematical entities are really found in nature, but I only wish to advance them for making careful calculations through mental abstraction.[184] George Berkeley too referenced the same tradition distinction between mathematical model and physical reality in his *De Motu*, §17,[185] only to show, in the content of his general argument for immaterialism, that the only way we may know the world is through model-making; that in fact both mathematics and physics provide rules and establish laws and neither are meant to provide the efficient cause:

> Because these things are not sufficiently understood, some unjustly repudiate mathematical principles of physics, evidently on the pretext that they do not assign the true efficient causes of things. When in fact it is the concern of the physicist or mechanician to consider only the rules, not the efficient causes, of impulse or attraction, and, in a word, to set out the laws of motion: and from the established laws to assign the solution of a particular phenomenon, but not an efficient cause.[186]

Berkeley goes on to say:

> And just as geometers for the sake of their discipline contrive many things which they themselves can neither describe, nor find in the nature of things, for just the same reason the mechanician employs certain abstract and general words, and imagines in bodies force, action, attraction, solicitation, &c. Which are exceedingly useful in theories and propositions, as also in computations concerning motion, even if in the very truth of things and in bodies actually existing [*in ipsâ rerum veritate & corporibus actu existentibus*] they are sought in vain, no less than those things geometers frame by abstraction

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[183] *Principia* I:5, Def. VIII Scholium *in The Mathematical Principles of Natural Philosophy*, trans. Andrew Motte. (London: Middle-Temple-Gate, 1729), p. 8; "Mathematicus saltem est hic conceptus. Nam virium causas & sedes physicas jam non expendo" [*Philosophiæ Naturalis Principia Mathematica* (London: J. Streater, 1687) p. 4].

[184] *Sämtliche Schriften und Briefe*, eds. Deutsche Akademie der Wissenschaften zu Berlin, Bd. 6, *Philosophische Schriften* (Darmstadt, Leipzig and Berlin: Olms and Akademie Verlag, 1923-) And in *Philosophical Essays*, trans. Roger Ariew and Daniel Garber (Indianapolis: Hackett, 1989), 121.

[185] George Berkeley, *De Motu; Sive, de Motus Principio & Natura, Et de Causa Communicationis Motuum*. London, 1721.

[186] *The New Synthese Historical Library,* vol. 41, *De Motu and The Analyst,* trans. Douglas M. Jesseph (NL: Springer-Science+Business Media, B.V. 1992), §35, p. 89.

(Ibid. §39, p. 90) … From what has been said it is clear that in investigating the true nature of motion, it will be of greatest avail first, to distinguish between mathematical hypotheses and the nature of things (§66, p. 103); Mathematical entities, however, have no stable essence in the nature of things: they depend on the notion of the definer: whence the same thing can be explained in different ways (*Ibid*., §67, p. 104) … I would hardly deny that the mind which moves and contains this universal corporeal mass is the true efficient cause of motion, and is the same cause, properly and strictly speaking, of the communication of this motion. But in physical philosophy, causes and solutions of the phenomena should be sought in mechanical principles. Therefore a thing is explained physically not by assigning its truly active and incorporeal cause, but by demonstrating its connection with mechanical principles (§69, 105) … The true nature of things, rather than abstract mathematics, (§79).

II.6 Matter as Obscure

If the absence of matter in quantity makes it certain, it must be the presence of matter in physics, inversely, that render its objects uncertain, doubtful, and obscure. Just as Thomas glossed the passage from Aristotle: *incertitudo causatur propter transmutabilitatem materiæ sensibilis; unde quanto magis acceditur ad eam, tanto scientia est minus certa* (*Comm. Met*. Lectio 41, Caput 29).

Res vero naturales, quamvis operationes sensui nostro offerant, differentias tamen ultimas, hoc est formas ipsas, ac substantias, a quibus passiones, & tandem actiones fluunt occultissime in profundo & obscuro naturæ sinu immersas habent: nec vix longa & assidua effectuum observatione & experientia, aliquantisper intellectui nostro, elucescunt … ideo naturalia non possunt abstrahi sicut mathematicalia, quia habent determinatam materiam, tali ac tali forma actuatam, & limitatam. Quam limitationem sine longo usu & obseruatione, cognoscere non possumus.

Piccolomini, *Comm. De Cert.* fol. 108r-v.

Natural things on the other hand, even though they offer their operations to our sense, they nevertheless keep the proximate differences—that is their very forms, and substances, from which affections and finally actions flow in the most hidden manner—[they keep it I say immersed] in the deep and obscure heart of nature. It is by a long and arduous observation and experience of the effects, that they shine, and <having remained> in our intellect for quite some time. … natural things cannot be abstracted like the mathematicals, because they have determinate matter, such-and-such actuated and limited, which limitation we do not get to know without long experience and observation.

Quantitative determinations (just as all other sensible species) are relevant to science only to the degree they are the signs for some non-dimensional, thus also suprasensible substantial activity; that is only insofar as they emanate from their proper subjects. But insofar as as it is studied in a celestial body, or an animal or any other limited matter then, since it arises and flows from the proper principles it renders knowledge arduous and difficult [*si autem quatenus vel est motus in corpore coelesti, vel in animali, vel alio quouis modo limitato: tunc cum oriatur & fluat*

ex principiis propriis, & materiam sibi propriam limitet, cognitionem reddet arduam & difficilem]. Though natural accidents are also properly and self-evidently sensed, they only are so insofar as they are factual, [*quoad esse* or *τὸ ὅτι*], not through their causes [*quoad causas*] which lie in the most hidden substances of things [*causas, quæ in substantiis rerum occultissimæ iacent* (*Comm. De Cert*. fol. 108v)].

Though substantial forms are intelligible in principle, they are approached only asymptotically by human experience. We are inevitably removed from the true forms of things we pose as the causes of their manifest effects. Whatever item of knowledge can be eventually drawn about enmattered substances and the natural world, it is mechanically dependent on the various ways they affect the senses of the perceiver. The fact that the substances of things are not as familiar to us as their affections on us, means they can only be indicated as the hypothetical causes of specific waves of impressions. So, any enmattered forms of perception would need to be remedied by a theory of demonstrative reason that can explain by inquiring (*historia*) and define by explaining (*scientia*).

II.7 Conclusion

Piccolomini offers this passage as the final answer to *causa certitudinis mathematicarum*, taking us back to the same *locus* from Aristotle's *Eth. Nic.* VI.8 1142a, about children being avid abstractors but unseasoned experimenters.[187] The child is to the adult, what the mathematician is to the natural historian. These two worldviews are differentially grounded in the world of sense particulars and the enmattered forms of perception, imagination, memory, and experience. Our immaterial thought, stranded as it is in a material world cannot fully encompass anything concrete and the materiality of natural subjects necessitate an accumulation of *sylva* into *peritia*. In that view, Piccolomini went a long way towards turning the never-ending asymptotic search for the natural forms into a merit. He offered an apologetics for natural history by arguing for the normativity of human sensibility and, hence, the constitutional obscurity of the world as a sense-object.

Thus, by the latter half of sixteenth century, *the worldliness of the* historia*—which had required a long line of apologists before it could be seen as a legitimate endeavor worthy of the attention of the humanist, the philosopher and the patron—was pitted against the exactness of the abstract* scientia. The natural sciences could never compel the mind with the same kind of absolute certainty—not *hac vita* at any rate—on account of the *matter* their objects were inextricably linked to. And, though the matter's absence in the latter makes demonstrative science possible, strictly speaking, from premises to conclusions, it does so only in regards to the insubstantial which is not subject to a *historia* as a collective endeavor; after all, no compilation of obser-

[187] "Mathematicæ sunt ex ab extractione, aliarum vero facultatum principia per experientiam assumuntur. Pueri autem non sunt expertes: ad abstrahendum vero maxime sunt idonei" (Piccolomini, *De Cert*. fol. 107v-108r).

vations and reports of lines and triangles from around the world ever brought anyone closer to illuminating all those properties that follow from them. And though the former is couched on an observational history of the concrete being, its conclusions are only as certain as the procedure followed to arrive at them (Randall, "Development of Scientific Thinking"). Nor could the certainty of these matter-independent disciplines be transplanted into the physical world, i.e. the field of the physicist and the physician, without abstracting them away from their proper subject-matters, to wit, the bodies of things their actual states are perfective of. There *did not seem to be any way of reconciling or adequating the utter certainty enjoyed in the private worlds of the mind and the concrete reality of the public world.*

While Ptolemy (2nd cen. AD) had revered mathematics as the best form of human knowledge, for standing at the middle, as it were, between *φυσική* and *θεολογική*, in the preface to the *De Revolutionibus* (1543), Osiander presented the mathematician and the physicist as having equal claims to scientific value even if they had unequal claims to exactitude. But with his commentary of 1547, Alessandro Piccolomini seems to have divorced certainty from the causal criterion of truth as determining the theoretical value of a given science.

Quantitative determinations (just as all other sensible species) were relevant to science only to the degree they are the signs for some non-dimensional, thus also suprasensible substantial activity; that is only insofar as they emanate from their proper subjects. But insofar as as it is studied in a celestial body, or an animal or any other limited matter then, since it arises and flows from the proper principles it renders knowledge arduous and difficult [*si autem quatenus vel est motus in corpore coelesti, vel in animali, vel alio quouis modo limitato: tunc cum oriatur & fluat ex principiis propriis, & materiam sibi propriam limitet, cognitionem reddet arduam & diffi-*

cilem]. Though natural accidents are also properly and self-evidently sensed, they only do so insofar as they are factual, the *quoad esse*, not through their causes [*quoad causas*] which lie in the most hidden substances of things [*causas, quæ in substantiis rerum occultissimæ iacent* (*Comm. De Cert*. fol. 108v)].

Echoes of this problematic would still be heard in the time of Descartes, if not already internalized in the Jesuit educational nexus he found himself in as a student. For by identifying that ingredient element whose absence in mathematics makes it certain, yet of nothing substantial; it is implied that the way to certainty in natural philosophy would be to somehow make mathematics concrete; to find a way of reading its objects into the physical arena of efficient causation, or make such a world from scratch. In the same view, to make mathematics substantial would require the world be created anew by a geometrizing agent, like the dēmiurge of the *Timæus*, or the God of Kepler, or the *lux* as medium of Grosseteste; while, to make natural philosophy certain would require all acts of nature be admitted into the order of mathematical relations.So Piccolomini concluded his little treatise by arguing it is the absence of matter in the principal subject of mathematics, quantity, makes it certain, inasmuch as it also makes mathematics unfit to account for any natural operation. Quantity is said to be more sensible than anything other accident, probably referring to the fact it is sensed convergently by two other proper senses (sight and , while it is eminently abstractible because it does not flow from some determinate nature as all beings do in nature.

Ultimately, in desiring to settle wherein that *certitudo mathematicarum disciplinarum* consists, Piccolomini seems to have divorced certainty from the causal criterion of truth that determines the theoretical value of a given science. Piccolomini's side of the debate seems to sug-

gest that an area of knowledge would have less claim to be apodeictically scientific to the degree that it relied on *more abstractible* affections and less firmly grounded in the natures of things, even if it would not compel assent in the non-negotiable way mathematical disciplines do. Benet Pereira, one of the most critical supporters of Piccolomini on *De certitudo*, went so far as to claim that mathematics is not, properly speaking, a science.[188] From his *De Communibus omnium rerum naturalium principijs & affectionibus* (Rome, 1562, 1576, 1585) one of the most widely read sixteenth-century treatises in physics:

> … [I]it has been shown before that mathematicians do not demonstrate from proper and natural causes, ergo the conclusion. Also, the mathematician does not consider the nature or essence of quantity, nor its affections, insofar as they have real being flowing from the nature of quantity, but merely insofar as they have intelligible being and insofar they can be known evidently and certainly, howsoever that may be accomplished. Therefore, the mathematician will not care whether the medium be or not be prior in nature but whether it is evident, certain and whether it is suitable for demonstrating the conclusion in question.
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> *... [S]upra fuit ostensum Mathematicos non considerat naturam ac essentiam quantitatis, nec affectiones eius, prout habent esse reale fluens ex natura quantitatis, sed tantummodo prout habent esse intelligibile, & prout possunt evidenter ac certė sciri quocunque modo id contingat; ergo Mathematicus non curabit, an medium sit prius secundum naturam nec ne, sed an sit evidens, certum & aptum ad demonstrandam propositam conclusionem*.[189]

In this passage two distinct epistemic expectations are allotted to two different modes of being, *esse reale* and *esse intelligibile*. Pereira introduces a 'double truth' as it were among the

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[188] "Mathematicus, neque considerat essentiam quantitatis, neque affectiones eius tractat prout manant ex tali essentia, neque declarat eas per proprias caussas, propter quas insunt quantitati, neque conficit demonstrationes suas ex praedicatis proprijs & per se, sed ex communibus, & per accidens, ergo doctrina Mathematica non est propriė scientia" (Benedictus Pererius, *De Communibus Omnium Rerum Naturalium Principijs & Affectionibus* [Rome: Franciscam Zanettum & B. Tosium, 1576] Liber 1, Cap XII, p.24 C). Later appended by Isaac Barrow in the lectures at Cambridge in 1664-1666 (printed in Latin in 1683 and translated in English in 1685: "*A Mathematician neither conſiders the Eſſence of Quantity, nor treats of its Affections, as they flow from ſuch Eſſence, nor declares them by the proper Cauſes by which they are in Quantity, nor forms their Demonſtrations from proper and eſſential, but from common and accidental Predicates"* (Isaac Barrow, *The Uſefulneſs of Mathematical Learning explained and Demonstrated: being Mathematical Lectures read in the Publick Schools at the University of Cambridge* [London: S. Austen, 1734] Lecture V, p. 80).

[189] Pererius, *De Communibus,* Liber III, fol.83, ll. B1-6.

mundane forms of knowledge. The mathematician fosters simply different interests than the philosopher. Needless to say, if nature was written like a book, the language it was written on for the sixteenth century could simply not be that of mathematics, and neither could shapes and figures be used as an alphabet, as Galileo would claim in the seventeenth century.[190]

[190] "Philosophy is written in this grand book—I mean the universe—which stands continually open to our gaze, but it cannot be understood unless one first learns to comprehend the language and interpret the characters in which it is written. It is written in the language of mathematics, and its characters are triangles, circles, and other geometrical figures, without which it is humanly impossible to understand a single word of it; without these, one is wondering about in a dark labyrinth" (From *Il Saggiatore* [Roma: Giacomo Mascardi, 1623] and *Le Opere di Galileo Galilei* [Florence: G. Barbera, 1890-1909], VI: 232. As translated in Stillman Drake and C.D. O'Malley, *The Controversy on the Comets of 1618* [1960], pp. 183-184). After all, the origins of the metaphor of the Two Books in early Christianity as found in Maximus the Confessor, for example, talks about material bodies being like the book's characters and syllables which offer only a partial knowledge, and more general and universal words which are difficult to reach, all of which express the wisdom of the divine Logos but do not reveal it. "The natural law, as if it were a book, holds and sustain the harmony of the whole of the universe. Material bodies are like the book's characters and syllables; they are like the first basic elements nearer to us, but allow only a partial knowledge. Yet such a book has also more general and universal words, more distant from us, whose knowledge is more subtle and difficult to reach. The same divine Logos who wrote these words with wisdom, is like embodied in them in an ineffable and inexpressible way. He reveals himself completely through these words; but after their careful reading, we can only reach the knowledge that he is, because he is none of those particular things. It is gathering with reverence all these different manifestations of his, that we are led toward a unique and coherent representation of the truth, and he makes himself known to us as Creator, by analogy from the visible, created world" (*Ambigua*, in *Le Opere,* X: 91, 1129 A, translation by G. Tanzella-Nitti available online at INTERS – Interdisciplinary Encyclopedia of Religion and Science, edited by G. Tanzella-Nitti, I. Colagé and A. Strumia. http://inters.org/book-of-nature.

CHAPTER III: MATTER AND SELF

> Διὸ καὶ τὸν Ἥφαιστον ἔσοπτρόν φασι ποιῆσαι τῷ Διονύσῳ, εἰς ὅ ἐμβλέψας ὁ θεὸς καὶ εἴδωλον ἑαυτοῦ θεασάμενος προῆλθεν εἰς ὅλην τὴν μεριστὴν δημιουργίαν.[191]

Chapter I showed how, in keeping up with a universe where living things form a gradient of cognitive power [*gradus cogniscitivæ virtutis*] in correspondence with their grade of perfection [*gradus perfectionis*], what makes humans unique in that chain, midway between the animal and the angel, is that their understanding requires phantasms [*convertendo se ad phantasmata*] gleaned from an external world.

Given these limits of this enmattered cognition, Chapter II explored some typical arguments that suggest a rather low expectation of certainty from the subject matter of natural philosophy. If that external world can exist in our minds through its semblances and not through its essence, there is no hope of ever acquiring scientific knowledge of the attributes the world manifests itself to us by. And though geometric essences can exist in the mind as they exist in prime matter, they cannot account for the inner being of substances.

Now, this chapter finds Descartes introducing the "scientific fiction" of a world where neither the knower nor the object of her knowledge are matter-bound; a view that dispenses with the material *substratum* from both ontological and epistemological considerations. In such a view, the world could actually be studied as an immaterial object, i.e. a pure form, an attribute, something that Chapter II declared as impossible; from the point of view of an equally immaterial soul, i.e. a pure intelligence, something that Chapter I showed humans were not supposed to possess.

The model for this direct acquaintance with an object is of course none other than a subject's acquaintance with its own self, i.e. the Cartesian *cogito*. But according to Chapter I, where the external world is posited as the immediate and proper object of the human *intelectus*, any capacity for self-reflexion would be operationally tied to the material world, the phantasms. Such was the natural bond between the human soul and the world that the mind could not reflect on a pure self prior to its acquaintance with the material world. The intuitive truth of the *cogito*—which had been framed in Thomist terms as knowledge of one's own self through its essence [*per sui essentiam*], or a *visio intellectualis*—in Augustinian terms—was reserved for the prelapsarian man or the glorified man, but not the 'wayfarer' [*viator*] of this life.

To seventeenth-century philosophical readers of Descartes—versed as they most likely would have been in Thomas's writings, it would seem that the meditator accesses a form of evident knowledge that would only be available to Adam, or to a human in his glorified state. So, we may read Cartesian metaphysics as a new state of conceptual equilibrium between old concepts and the reformed distinctions of self-world, matter-thought, such that it makes possible in *vita præsentia*, a piece of intuitive knowledge that was promised for the *vita altera.*

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[191] *Procli In Tim.* Γ 33B, p. 80, ll 22-24.

However, by making possible the reflexive operation of the mind over its acts prior to and independently of external things [*res extra me posita*], the existence of a world at large would become just another item subject to radical doubt. Consequently, the existence of matter that was admitted as an indemonstrable postulate in premodern times (Ch. I-II), would stand as a demonstrable theorem in the modern (Ch. III.IV).

III.1 Nothing is both True and Certain

Chapter II focused on a 1547 essay on the certitude of mathematics annexed to the pseudo-Aristotelian *Quæstiones mechanicae*, which—by way of polarizing natural philosophers against mathematicians on the nature, range of application and value of mathematical demonstration—precipitated a long-lasting debate that continued into the second half of the sixteenth century (Pereira, Barozzi, Clavius, Dee),[192] culminating in the Jesuit *Ratio Studiorum* and echoing as late as the first half of the seventeenth (Descartes, Hobbes and Isaac Barrow). The controversial conclusion reached in the commentary that started it all by Alessandro Piccolomini was that mathematical disciplines fall short of the ideal of apodictic science as expounded in the *Analytica posteriora*. For, whatever undeniable exactitude obtains in disciplines as abstract as the one Piccolomini too was commenting on—i.e. mechanics alongside harmonics, optics, astronomy, geometry and arithmetic—they owe it to their attenuated subject matter [*ex subiecti ipsius ratione; διὰ τὴν ὑποκειμένην ὕλην*], not some intrinsic virtue of their demonstrations [*non ex vi demonstrationis*].[193] The same view would inversely entail that whatever uncertainty obtains in the sciences of nature, it was not due to some intrinsic weakness in their demonstration, but the composite nature of their subject matter.

Indeed, if all nature is said 'like the snub' [*sicut simum*], the natural philosopher is compelled by the very nature of their subject to study affections like 'curvature' [*curuitas*] *in concre-*

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[192] Franciscus Barocius, *Opvscvlvm* (Padua 1560); Benet Pereira, *De Communibus Omnium Rerum Naturalium*, (Rome, 1562); John Dee's preface to *The Elements of Geometrie* (London, 1570;)Christophorus Clavius, *Opera Mathematica* (Mainz, 1612);

[193] Presented as also Proclus's view: *Geometrarum rationes habere vim & necessitatem ex subiecta materia: non autem ex natura demonstrationis* (cap. XI, fol. 107v ll. 24-26); *non ex vi demonstrationis*, *sed ex subiecti ipsius ratione* (*Commentarium*, cap. XII, fol. 109v ll. 10-15). Citing directly from Proclus: *πανταχοῦ, γὰρ τὸ ἀναγκαῖον, ἔχουσι οἱ γεωμετρικοὶ λόγοι διὰ τὴν ὑποκειμένην ὕλην.*

to or *καθ' ὑποκειμένου*, as manifested in this or that flesh. After all, the *Analytica posteriora* model of scientific inquiry suggests that *leaf-shedding* be studied in *broad-leaved trees*, or *thunder* studied in *cloud formations*, at no point of which could attributes be abscinded from their proper *substrata*. For the more such enmattered affections are studied as separated from their proper *substratum* [*ᾗ κεχωρισμένον*], i.e. as something they are not, the more they become alienated from their real material and efficient causes. But it is exactly these one-to-one causal relations between physical subjects and their *per se* properties that are meant to be collected in the process of natural history and be ultimately transcribed onto convertible and immediate predications in the process of *scientia*.

Effectively, Piccolomini granted certainty as an undeniable intellectual experience in exchange for rendering mathematics unfit to explain the inner-workings of nature. For insofar as what can be known with certainty is about forms studied in isolation of *any kind of natural substrate*, they stand outside the order of natural facts. In the name of such exactness, a discipline must rely on such severe abstraction [*abstractio* or *extractio*] from sensible matter that it can no longer track the natural production of effects out of their proper causes.

In diagnosing wherein that *certitudo mathematicarum disciplinarum* consists, Piccolomini *seems to have affirmed truth, not certainty, as determining the theoretical value of a given science.* If indeed the exactness obtained is due to their incomplete or non-concrete status, what these abstract sciences gain in *ἀκριβολογία* they relinquish in truth-value [*ἀλήθεια*]. If indeed something is most true to the degree it causes other things to be true, in the manner fire is hotter to the degree it causes other things to be hot, something would be eminently true to the degree it is causally self-sufficient and prior to others (*Met.* a.1 993b). However, mathematical *εἴδη* for the

Peripatetic are neither self-subsistent nor causally prior to any other *thing* in nature.

Indeed, in and of themselves mathematical species are inert constructions in the imagination or a set of nominal relations of terms. And regardless of how neatly these may be presented to a student from the more intelligible to the less intelligible *more geometrico*, they cannot produce anything the teacher has not already included in them. Given these attributes fall outside any possible form of physical causality, how can they be meaningful to a theory of scientific discovery that is supposed to advance from what is more intelligible *ad nos*, to what is more intelligible *secundum naturam*, as pronounced in the beginning of the *Physica*?[194] Ultimately then, whatever certainty obtains in so attenuated apodeictic environments as that of geometry, it must only be due to their dealings with the surface-effects of our reality, many removes away from the actual subjects reality is dispensed in and scientific knowledge ought to make reference to.

All and all, so far as it is attainable by the inevitably enmattered modes of human cognition, natural reason is not sufficient to render an object *both certain and true.*[195] Only if we could determine the proximate agents of the revolutions of the heavens and their unseen motives, could we ever settle if it is the sun that revolves around the earth, or the earth around the sun. In lack of a physical explanation that would settle the true model of the heavens by means of the proper

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[194] *"πέφυκε δὲ ἐκ τῶν γνωριμωτέρων ἡμῖν ἡ ὁδὸς καὶ σαφεστέρων ἐπὶ τὰ σαφέστερα τῇ φύσει καὶ γνωριμώτερα· οὐ γὰρ ταὐτὰ ἡμῖν τε γνώριμα καὶ ἁπλῶς. διόπερ ἀνάγκη τὸν τρόπον τοῦτον προάγειν ἐκ τῶν ἀσαφεστέρων μὲν τῇ φύσει ἡμῖν δὲ σαφεστέρων ἐπὶ τὰ σαφέστερα τῇ φύσει καὶ γνωριμώτερα* (*Physica* I, 184a || 18-21) [*Innata autem est ex notioribus nobis via, & manifestioribus ad manifestiora naturae, & notiora: non enim sunt eadem & nobis nota, & simpliciter. Quapropter necesse est ad hunc modum procedere ex immanifestioribus quidem naturae, nobis autem manifestioribus ad manifestiora naturae, & notiora*]*"* (recensio of the *translatio nova from De Physico Auditu*, in *Aristotelis Opera*, IV: fol. 4v a).

[195] Pereira relates to the reader of the De Communibus that a popular opinion among philosophers has it that nothing or very few things can be found in the natural world that are as known to us as they are to nature: "Peruulgata eſt opinio apud Philoſophos, in rebus naturalibus aut nihil aut perpauca reperiri quæ nobis ſint nota pariter ac ſecundum naturam, propterea quòd rerum effecta & accidentia, quæ nobis manifeſta ſunt, habentur ignota ſecundum naturam, è contrario autem ſubſtantia & cauſſæ, quæ ſunt notæ ſecundum naturam, nobis ſunt ignotæ: At verò in diſciplinis mathematicis, aut omnia aut certè pleraque ſunt nota nobis iuxtà atque ſecundum naturam" (Pererius, *De Communibus*, Liber III, Cap. VII, fol. 81, ll. A9-B2).

efficient, and final causes, one astronomical model is preferred over another on the basis of the simplicity of its hypotheses and how it lends itself to easy computation. Before the identifying the proper agents and understanding their ways, any given astronomical hypothesis would merely be offered as a 'likely story' [*similitudo veri*]. But how could a natural philosopher ever attain discover the real causes of planetary motion if he didn't even profess to know the essence of the most minute insect?

III.2 Matter-independent Knowledge

In support of the weakness of human cognition, Thomas Aquinas had related a story of a philosopher who spend no less than thirty years in isolation, in order to discover the nature of the bee.[196] Roger Bacon too, one of the first experimenters of the High-Medieval times no less, solemnly declared we can never truly know the natures of things not even of a single fly:[197]

> No one is that wise in the nature of things [*in rerum naturis*], to know (how) to verify all the truths that pertain to the nature and the properties of a single fly, nor give the causes of its proper colors, and why it has the number of legs it has, not more or less, or give the proportion for its members. Man is therefore incapable of perfect knowledge in this life [*hac vita*].[198]

And yet, Aquinas was a firm believer that the world is structured in such a way by a reasonable and benign Artificer, that a perfect knowledge of a substantial form would make immediately known the affections that emanated from it by the same certainty we know that the sum of the angles a triangle is two right angles, through an unfolding of the *logos* of the essence. "[I]t is quite evident," he tells us, "that the quiddity of a thing can be a principle of knowledge with regard to everything belonging to such thing, or excluded from it."[199] The commitment to the in-

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[196] Thomas Aquinas also used the substantial forms of insects to showcase the limits of human *cognition*, arguing implicitly for the unknowability, *a fortiori*, of substances more complicated than the fly or the bee: "…[O]ur cognition is so weak that no philosopher has ever been able to investigate completely not even the nature of a single fly: so they say, that one philosopher spend thirty years in isolation, in order to know the nature of the bee [*si homo posset perfecte per se cognoscere omnia visibilia et invisibilia, stultum esset credere quæ non videmus; sed cognitio nostra est adeo debilis quod nullus philosophus potuit unquam perfecte investigare naturam unius muscae: unde legitur, quod unus philosophus fuit triginta annis in solitudine, ut cognosceret naturam apis*] (Thomas Aquinas, Proemium to *Expositio in Symbolum Apostolorum*)."

[197] "No one is that wise in the nature of things [*in rerum naturis*], to know (how) to verify all the truths that pertain to the nature and the properties of a single fly, nor give the causes of its proper colors, and why it has the number of legs it has, not more or less, or give the proportion for its members. Man is therefore incapable of perfect knowledge in this life [*hac vita*]" Roger Bacon, *Opus Majus*, I. Cap. X [1897], 15.

[198] Roger Bacon, *Opus Majus*, ed. John Henry Bridges (London and Oxford: Williams and Norgate, 1897), I: Cap. X, p. 15.

[199] *ST* Ia Q58.A5, c2; with the *proviso* that this does not apply to God's supernatural ordinance, arguing that demons and angels can neither be deceived in natural matters but the former, due to their perverse will, might be deceived with regard to supernatural matters.

telligible structure of the world was extremely influential in Dominican circles and beyond, still echoing in the time of Piccolomini, who stated in his *Commentarium* that:

> Whosoever then versed in the nature of reality [*in natura rerum eruditus*], gets to know that final difference that alone is in act (Ar. *Met*. VII) or proper substantial form of some subject, he will be able to use it for deducing the passions [*vltimam illam differentiam, quæ sola actu est, ... seu propriam formam substantialem alicuius subiecti, cognouerit, hac ad concludendas passiones vti poterit*]. That is because, as they say, the passions flow from the forms in a certain order, and they are found in a subject [*certo ordine a formis passiones fluunt, & in subiecto reperiuntur*].[200]

Would that we could behold the idea of 'fire' we would be able to deduce its primary qualities, such as 'dryness' and 'hotness' as much as we would further deduce secondary qualities, such as its lightness,' and powers such as 'melting wax and hardening clay.' And yet, no human being can claim true knowledge of the final difference of a substance,[201] not even of a lowly fly, any more than a man born blind can claim knowledge of colors.

In the beginning of Chapter II we quoted from Dante's *Purgatorio* that every substantial form: ingathers/ the force that is distinctively its own,/ a force unknown to us until it acts—/ it's never shown except in its effects,/ just as green boughs display the life in plants.[202] This elusive God's point of view of the natural world was suggested even more evocatively in the next century in the celebrated prose of Thomas Browne, the physician, who claimed in a text written in 1630s (and published without his authorization in 1643):

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[200] Piccolomini, *Commentarium*, fol. 105v.

[201] Duns Scotus too claimed that in regards to substances we only have a 'vocal disposition,' the kind a man born blind has of colors [(*D)e substantiis habemus habitum uocalem, sicut caecus natus syllogizat de coloribus* (John Duns Scotus, *In Meta*. II.2–3, *Opera phil*. ed. T. Noone et al. [St. Bonaventure, NY: Franciscan Institute, 1997–2006] III:. n. 119)], presumably refering to the fact we can use the same words as people with unimpaired vision do even without having a proper concept based on experiential data.

[202] *Divine Comedy*, trans. Allen Mandelbaum, *Purgatorio*, Canto XVIII, ll. 49-54.

> For the eyes of God, and perhaps alſo of our glorified ſelves, ſhall as really behold and contemplate the World in its Epitome or contracted eſſence, as now it doth at large and in its dilated ſubſtance. [I]n the ſeed of a Plant, to the eyes of God, and to the underſtanding of man, there exiſts, though in an inviſible way, the perfect leaves, flowers and fruit thereof: (for things that are in *poſſe* to the ſenſe, are actually exiſtent to the underſtanding.) [203]

What about the knowledge of our first father, Adam? From a sermon delivered by Robert South in the second half of the seventeenth century:

> He came into the World a Philoſopher, which sufficiently appeared by his writing the Nature of things upon their Names: he could view Eſſences in themſelves, and read Forms without the comment of their reſpective Properties: he could see Conſequents yet dormant in their principles, and effects yet unborn and in the Womb of their Cauſes[204]

Despite the intuitiveness of these biological illustrations, the best illustration of such affections flowing necessarily from their proper subjects was actually gleaned from geometry, in the manner, say, an internal sum of two right angles follows from the nature of the triangle. Indeed theorem XXXII of Euclid's *Elementa*, Book I, was one of the most widely used illustrations of geometrical necessity. It appears as early as Aristotle's *Posterior analytica*, *De Anima*, *Metaphysica*;[205] Thomas[206] and everyone between, and as late as Spinoza's *Ethica*, Book I, PXXI.[207]

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[203] Thomas Browne, *Religio Medici* (London; R. Scot, T. Baſſet, J. Wright, R. Chiſwell, 1682) 115-6, §50.

[204] Robert South, "Man was made in God's Image," *Sermons Preached upon Several Occasions* (Oxford: H. Hall 1679), pp. 127, 128.

[205] Theorem 32 makes its appearance across the entire corpus, some of its most important applications located in: *Analytica Posteriora* 71a, 73b; *Met*. 1016b, 1051a; *De Anima* 402b; *Physica* II, 200a.

[206] *ST* Ia Q12.A7, c. 2. Later in the *Summa* Aquinas is differentiating between the two modes of necessity, intrinsic and extrinsic, and under the category of intrinsic causality, some fact may pertain necessarily due to a *material principle* as in all composite things that are necessarily corrupted by the contraries, or due to a *formal* principle, as it is necessary for a triangle to have its three angles equal to two right ones. The latter one is a case of natural and absolute causality. "Respondeo dicendum quod necessitas dicitur multipliciter. Necesse est enim quod non potest non esse. Quod quidem convenit alicui, uno modo ex principio intrinseco, sive materiali, sicut cum dicimus quod omne compositum ex contrariis necesse est corrumpi; sive formali, sicut cum dicimus quod necesse est triangulum habere tres angulos aequales duobus rectis. Et haec est necessitas naturalis et absoluta (*ST* Ia Q82.A1, c1)"

[207] "… à ſummâ Dei potentiâ, ſive infinitâ naturâ infinita infinitis modis, hoc eſt, omnia neceſſariò effluxiſſe, vel ſemper eâdem neceſſitate ſequi; eodem modo, ac ex naturâ trianguli ab æterno, & in æternum ſequitur, ejus tres angulos æquari duobus rectis" *Ethica*, Book I, PXXI in *Opera posthuma, quorum series post præfationem exhibetur* (Amsterdam: Rieuwertsz, 1677) p. 18.

And yet Ch. XI of Piccolomini's *Commentarium*, showed the analogy is flawed in that geometrical properties do not flow immediately and properly from their subject as a matter of natural action. This means that our intuition about a God's point of view of a real being relies on the geometer's view of a figure in intelligible extension, which, though certain, is after all not concerned with real things. So, although the closest approximation of *scientia*—at least from the English and French nominalists of the Renaissance[208]—is from mathematical disciplines, the majority of the natural philosophers of the Renaissance believed that what we gain in clarity in these sort of demonstrations we lose in truth value. In their view, one cannot ever hope to achieve such certainty in the study of natural attributes, without also severing their causal ties to the *substratum* of this world. Put in the traditional terms, nowhere in nature could something be rendered as intelligible *ad nos*, as it is intelligible *naturā* or *naturæ*.

So though nature proceeds [*via procedendi*, cf. Pererius, *De Communibus*] from substance to accident, or from the world *extra animam* to the world within the soul in a perfectly intelligible manner, such an apodeictic science of nature must ever remain counterfactual to the state humans find themselves in, with the world being irreparably obscure as a matter of natural fact. Ultimately, one reaches the following *impasse*: *if there were a natural* substance *that could exist in our intellect exactly as it existed in the real world,* per sui essentiam, *it would certainly not be of our world;* [209]*And if there were a mode of cognition that would render the intrinsic nature of our sensible world known as evidently as those subjects of geometry, that would certainly*

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[208] Josh Longeway, "The Place of Demonstratio Potissima in some 16th-Century Accounts of Mathematics" cited earlier.

[209] Augustine referred to immaterial objects of what he calls a *visio intellectualis* in *Gen. ad Lit.* XII, 24 (*Corpvs Scriptorvm Ecclesiasticorvm Latinorvm*, ed. Joseph Zycha, vol. XXVIII, sect III, pars 4, *De Genesi ad Litteram Libri Dvodecim* ... [Prague: F. Tempsky; Vindobonae: F. Tempsky; Leipzig: G. Freytag, 1894], 416-418. It was understood by Aquinas as a manner of understanding where the object is present in the soul in its essence [*ea quæ sunt in anima per suam essentiam* (*ST* Ia Q12.A11, obj. 4).]

not be human.

Given how well enshrined was this natural infirmity of human cognition in philosophical and theological discourse,[210] what would it mean for a statement to be as self-evident as a geometric proposition yet also capture the true act of a self-subsistent subject? To demand certainty from the natural world would require: either (A) it be studied *qua* immaterial as something it is not, because *omnia sicut simitas dicuntur*; or (B) be studied through the lenses of a higher and less material form of cognition, which humans do not possess, because humans are neither born with innate species *per se nota*, nor are they created with the ability to know their own selves.

In either case there simply did not seem to be any way of reconciling or adequating the utter certainty enjoyed in the private worlds of the mind and the concrete reality of the public world. By abandoning all those metaphysical scruples from *Met.* a.1 993b that allowed the causal structure of the world to dictate what is more true, Descartes would wonder what kind of world we would get if we set certainty as the criterion of truth. So, his goal was to reframe the entire discussion and renovate metaphysics with the goal of somehow relating our forms of inner certainty to the world. Where Piccolomini, Pereira and a long line of commentators after Averroës follow closely Aristotle's precaution to "only look for certainty in things unmixed with matter," [**C1:** *τὴν δ' ἀκριβολογίαν τὴν μαθηματικὴν οὐκ ἐν ἅπασιν ἀπαιτητέον, ἀλλ' ἐν τοῖς μὴ ἔχουσιν*

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[210] Here is some testimonies about the infirmity of human cognition spanning the Catholic-Protestant divide: Jean Fernel, *De Abditis*, Book I, ch. 2, p. 9: "De his nihil certum, nihil constans, nihil omnium consensu probatum definiri posse sentio, quandiu mens humana corporis hoc veluti ergastulo inclusa, neque materia, neque formam sensibus cognoscit;" Petrus Ramus's *Dialectique* (Paris: André Wechel, 1555), Book I pg 8 ll 14-21: "Or la cognoiſſance des formes en chacune choſe eſt fort difficile & cachée à l'homme, & ſi elles ſont veües, elles ſont bien ſouuent ſans nom: comme tu vois a l'œil vne main, vne eſpée, vn anneau par ſa forme, & neantmoins tu ne pourrois dire ny exprimer chacune d'icelles formes par ſon nom, & à peine certes par longue circuition de langage;" Philipp Melanchthon, *Erotemata Dialectices* (Frankfurt: Chr. Egenolphum, 1547) wrote: "Non enim cernimus oculis ſubſtantias tectas accidentibus, Sed mente eas agnoſcimus. … Hac qualicunque deſcriptione contentiſimus, & cogitemus, quàm ſit imbecilla acies humanæ mentis, quæ quaſi foris & procul res aſpicit, nec intus eas contemplatur" (1550 edition fol. 13v)]

ὕλην (*Met*. a.3, 995 a14-17)], Descartes looks for certainty where, traditionally, certainty is not to be found.

In his dedicatory letter to the faculty of Sorbonne, Descartes talks about a method he had developed for resolving any kind of difficulties arising in the sciences [*quandam ... Methodum ad quaslibet difficultates in scientiis resolvendas* (AT VII: 3; CSM II: 4)]. Descartes claims he had already applied that method in a great variety of subjects, from the physics of earthly bodies to physiology, meteorology and astronomy, and from geometry to optics and physiology,[211] that is, irrespectively of the firm boundaries drawn between them as apodeictic sciences, and regardless of their order according to their matter-independence. Most importantly, moving forward in the *Meditationes*, Descartes expects to use subjective certainty as the sole guide in studying the three principal topics of the first philosophy that traditionally scaled across different degrees of immateriality: God, the *actus purus*; the human *mens* which was a *forma subsistens*; the *anima* which was a non-self-subsistent *actus corporis*, and quantity which used to be a *forma accidentalis* attached to natural things.

This already marks a great innovation or, from the point of view of the occasional Peripatetic reader, just as great a transgression of an important maxim in the sciences we encountered earlier: that *the certainty that obtains in mathematical disciplines ought not be sought in everything, but only in those subjects that are exempt of matter* [**C1**]. For one, Descartes would not expect different degrees of certainty from different subjects on account of the unity of the natural

[211] As prefigured in his early *Regulæ*, and put to use in his unpublished *Traité du Monde et de la Lumière*, to be accompanied with *L'Homme*; also his *La Dioptrique*, and *Les Meteores*, from his *Discours sur la Methode* (Leiden: Ian Maire, 1637)].

light shining on all objects indiscriminately (AT X: 360; CSM I: 9).[212] Later on, in *Regula IV*, delineates a form of general knowledge that should contain "the primary rudiments of human reason and extend to the discovery of truths in any fields whatever." In such a broad purview, the illustrations of regular mathematics would merely "its outer garments than its inner parts" (AT X: 374; CSM I: 17).

The break was expressed even more clearly in the *Regulæ* that claimed "… we should not regard some branches of our knowledge of things as more obscure than others, since they are all of the same nature and consist simply in the putting together of self-evident facts (AT X: 428; CSM I: 50)." The experiment should constantly be following an order, whether it is actually present in … or ingeniously read into it, for as mentioned in the *Discours*: "… despite the diversity of their objects, they agree in considering nothing but the various relations or proportions that hold between these objects (AT VI: 19-20; CSM I: 120)." What is more, Descartes tells us: "since I did not restrict the method to any particular subject-matter, I hoped to apply it as usefully to the problems of the other sciences as I had to those of algebra." Finally, in contrast to the scientific values in Piccolomini's time, the value of each science for Descartes would not depend on the dignity of the subject and its standing in the order of things, but rather to the degree it contributes to this *sapientia universalis* (AT X: 360; CSM I: 9). Free from the peripatetic scruples over crossing the established disciplinary boundaries [*οὐκ ἔστι μεταβάντας ἐξ ἄλλου γένους δεῖξαι*, *APo*. I.7 75a 38] and free as well of different expectations of certainty from these disciplines depending on how much matter they contained [**C1**, **C2]**, Descartes's *lumen naturale* offered a vantage point beyond any *substrational limitations*. It is clear that the analogy, bearing

[212] The light-sun analogy of AT X: 360 bears an interesting parallel with the unity of the light of simple natures in Bacon's *Præfatio* to the *Novum Organum*.

obvious ties to Plato and St. Augustine, relates the perceived incorporeality of light and its undiscriminating emission with an immaterial and all-encompassing knowledge. The same analogy appears frequently in the works of Francis Bacon, who had already critisized the sterile divisions between the sciences in *The Tvvo Bookes of the proficience and aduancement of Learning, diuine and humane* (1606).[213] He states in the unpublished *Valerius Terminus* that:

> … sciences distinguished have a dependence upon universal knowledge to be augmented and rectified by the superior light thereof, as well as the parts and members of a science have upon the *Maxims* of the same science, and the mutual light and consent which one part receiveth of another.[214]

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[213] In that work Bacon subverted the Aristotelian requirement of self-contained subject genera by arguing that "no perfect diſcovery can bee made vppon a flatte or a leuell. Neither is poſſible to diſcover the more remote and deeper parts of any Science, if you ſtand but vpon the leuell of the ſame Science, and aſcend not to a higher Science" (*Tvvo Bookes*, Book I, fol. 24v-25r); when talking about the prospect of a *Historia Naturæ Errantis* "to correct the parcialitie of Axiomes, and Opinions: which are commonly framed onely vppon common and familiar examples" (*Tvvo Bookes*, Book II, fol. 8v). Or, when he presents a kind of *philosophia prima* or *Svmarrie philosophie* as "*a receptacle for all ſuch profitable obſervations and Axioms, as fall not within the compaſſe of any of the ſpeciall parts of Philosophie or Sciences; but are more common, and of a higher ſtage* (*Tvvo Bookes*, fol. 21r)." He goes on to mention rules and axioms that cut across many sciences and arts finally admitting that instead of mere transcendental similitudes they are "the ſame footſteppes of Nature, treading or printing vppon seueral subjects or Matters" (*Tvvo Bookes*, fol. 22r).

[214] *Valerius Terminus* §8, *The Works of Francis Bacon* III: 229.

III.3 Due Place

Chapter I explored how the human condition formed a crucial piece in the fulfillment of an order of creation, a *scala naturæ*, or *ordo universi*, that ranged from pure potentiality, *prima materia*, to pure activity, the *actus purus*. If such a human plane of existence—that "amphibious piece between a corporal and ſpiritual Eſſence"[215]—did not materialize, the world would be incomplete and that would impute a case of a cosmic injustice on the part of an all-powerful being.[216] In the spirit of the same theodicy, however, provided that the creator is indeed a benevolent being, He is no more expected to deny a possible being its due existence, than to endow it with something useless,[217] or worse, something acting against its nature.[218]

On the basis of this agathic mentality, Thomas chose Aristotle as the giant he would stand on, and by the same principle he also blazed his own interpretative path. For in his views he saw all suspicion about the uselessness, imperfection and unreality of the material world—brought to the fore once again in the history of Christian thought by the Gnostic sect of his time, the Cathars—would be dispelled. Roger A. Johnson confirms that: "[I]t was the newly translated texts of Aristotle, and not the older Neo-Platonism of Augustine, that provided the antidote for the so-called Manichees of the thirteenth century."[219]

Ultimately, Thomas turned all perceivable *privations* or shortcomings of the human being

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[215] "[W]e are onely that amphibious piece between a corporal and ſpiritual Eſſence, that middle form that links thoſe two together, and makes good the Method of God and Nature, that jumps not from extreams, but unites the incompatible diſtances by ſome middle and participating natures" (Thomas Browne, *Religio Medici*, p. 78).

[216] "ἀγαθὸς ἦν, ἀγαθῷ δὲ οὐδεὶς περὶ οὐδενὸς οὐδέποτε ἐγγίγνεται φθόνος: τούτου δ᾽ ἐκτὸς ὢν πάντα ὅτι μάλιστα ἐβουλήθη γενέσθαι παραπλήσια ἑαυτῷ" (*Timæus*, 29e 1-3).

[217] "nihil autem est vanum in operibus" Dei (Q67.A4, ad 2.2); "natura non deficiat in necessariis" (Q78.A4, c.).

[218] "… inconveniens enim est quod naturalis operatio alicuius rei totaliter impediatur per id quod est sibi secundum naturam" (Q84.A3, c 2)].

[219] Roger A. Johnson. "Christians Orthodox and Heterodox; Thomas Aquinas and the 'Manichees,'" in *Peacemaking and religious violence from Thomas Aquinas to Thomas Jefferson*, 33-72. (Oregon; Pickwick Pub., 2009), 34.

into negations: a man can no more ask to be without a body than a rock can ask to be without weight; and he cannot complain for not having been endowed with a higher form of cognition, anymore than a rock can complain for not having the power of sight. Humans are not fallen angels, having their wings been clipped as it were, nor will they ever become angels, by growing wings in the afterlife, and that is in accordance with the divine plan of creation.

Way before Thomas Browne's metaphor of the amphibious nature of human beings, there has in fact been a long history of metaphors about the mixed status of the human being involving a mixed habitat across the elements of water and air. Different versions of that simile express different views about the nature of man sustained in this ambivalent existence. Dante wrote that:

> [A]lthough on one side it [the human soul] is free from material on another side is impeded (like a man who is immersed in the water all except his head, of whom it cannot be said that he is all in the water or all out of it).[220]

Jean-Joseph Surin (1600-1665), French Jesuit mystic, preacher, and exorcist, pictured the human being completely submerged in water and sustained in life through a breathing apparatus:

> I am told that there are pearl fishers, who have a pipe that goes from the sea floor to the surface, where it is buoyed up with corks, and that through this pipe they breathe—and are yet at the bottom of the sea. I do not know if this be true; but in any case it expresses very well what I have to say; for the soul has a pipe that goes to heaven, a channel, says St. Catherine of Genoa, that leads to the very heart of God. Through it she breathes wisdom and love, and is sustained. While the soul is here, fishing for pearls at the bottom of the earth, she speaks with other souls, she preaches, she does God's business; and all the time there is a pipe that goes to heaven to draw down eternal life and consolation.[221]

In the Thomist version of the purgatory, the human soul will instead be miraculously suspended from external reality, i.e. out of the "natural element" of its intellect—as if one were assisted into holding their breath indefinitely—until the time of Resurrection where it gets plunged

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[220] Dante Alighieri, *The Convivio of Dante Alighieri* (London: J. M. Dent, [1903] 1908) III.7, p. 173.

[221] Jean-Joseph Surin [1600-1665], mentioned in Aldous Huxley, *The Devils of Loudun* (NY; Harper and Row, 1965), ch. 11, p. 309..

again into the *same* body in its glorified form—as if returned to same body of water in a more purified form. So if we were to push the simile even further, we could say the Gnostics saw the human being as an air-breathing animal forcibly trapped in the water against its nature, while Thomas saw the human being much like a marine mammal, an air-breather fully adapted to a marine ecosystem.

Although the idea of a *scala naturæ*, or *Chain of Being*, an uninterrupted cascade of Being that encompasses everything possible, goes back to Greek and Roman antiquity as Arthur O. Lovejoy has amply attested, Thomas is credited with extending it into matters epistemological. For the same reason the human soul had to be embodied lest there be a *saltus* in the order of subsistence from the animal to the angel; the human-grade power of understanding, no matter how weak and incomplete in comparison to pure intelligences, was crucial for the completion of an order of the *vis cognitiva* from rock, plant, to animal, human, angel and God.[222] And just as man cannot ask for a better form of subsistence in the grand scheme of everything, like that of those intelligences that spanned the infinite distance between human to God, he could not ask for a more accurate or more comprehensive worldview, at least not in *this* life. The proper object of that uniquely human form of cognition in *vita praesentia* was material reality [*quidditas sive natura in materia corporali existens* (Q84.A7, c.)]; *ea quæ sunt extra* (Q94.A2, c. 3)] sensed through its *similitudines*, stored into *phantasmata*, and understood by *species intelligibiles* abstracted therefrom and contained in the *intellectus passibilis*.

If, despite of all those characteristic limitations of the human intellect that had carved off its own niche in the order of perfection, the human mind was naturally capable of grasping reali-

[222] Cf. Q89.A1, co 3.

ty in another way than by abstraction from sensible particulars, or understanding it by any higher degree of certainty than what is possible, the soul's embodiment would be deemed unnecessary, useless, if not obstructive to some more exalted piece of knowledge that is otherwise naturally available to it; like the Platonic Ideas prior to the soul's passing the river of oblivion, or the *γνώσις* of the Gnostics after the soul returns where it originally belonged. In fact, according to Thomas's approach, out of all intelligent agents, man was the *only* one set to intend to a world that subsists outside of him. In fact, the soul tends toward the world as naturally as fire extends to the heated body.[223]

So we reach a defining point in the development of the notion of premodern matter according to which *the reality of a world outside one's self was presupposed in the nature of that uniquely human point-of-view*. We could even say that the subsistence of the external world, no matter how dimly manifested to humans, was part of the overall providence of God. In that case, it would seem the material world complements the human ways of knowing in the same way perhaps the oxygen complements the lung it fills. What Thomas did was to make each created nature encompass a specific grade of cognitive power, attuned to a specific grade of intelligible object. The external world of sense that consists in all those substantial individuals that populate it and their affections by which they manifest to us, is indeed the "natural element" of the human intellect.

Similarly, the knowledge of the sensible world is the only way one may gradually ascend to the knowledge of the invisible world: whatever we may speculate about the nature of one's own intellect, separate intelligences and the *actus purus*, is based on our acquaintance with phys-

[223] Cited earlier, *ST* Ia.56.A1 c. 1.

ical bodies and their actions. In that framework, it is only via our utterly shapeless *intellectus passibilis* we can contemplate the operation of more exalted intellects; and whatever higher forms of intuitive knowledge can be speculated about, humans form notions of them through discursive operations, negation and analogy.

Drawing on the previous simile, whatever higher forms of respiration we may conceive—i.e. more able lungs perhaps adapted for a more oxygen-rich air—they can only be reached by considering different instances of existing respiratory systems in the natural world. Only from that departure point can we then ascend by negation or analogy to a vanishing point of perfection where lung and air would perhaps be one (just as the *actus purus* is identical with the act of thinking). Such higher forms of lungless existence however are not available to humans, not even in the next life.

What is more, seeking conceptual equilibrium around the postulate that everything in the body is for the knowledge of the soul entails certain compromises in regards to the nature and fate of the soul. For it seems that, within the limits of reasonable interpretation of Aristotle's word, a world where body is the sole source for the soul's knowledge and things subsisting *extra* are the only natural object of the human intellect, any capacity for self-reflection is operationally tied to the same material world, and by consequence, to its respective restrictions.

Overall then, the Thomist world view: (1) gave priority to the external world over the internal means available for intending to it, the *intelligible species*, or the *intentiones* of the intellect; (2) denied knowledge of one's essence in *vita præsentia*; as he also denied: (3) the concomitant ability to determine the structural fate of the human soul after the dissolution of the body.

By the beginning of the sixteenth century, in the Latin Renaissance, all these restrictions

in Thomas's interpretation of the Aristotelian texts were perceived as pressing concerns, awaiting some form of revision. In fact, it appears that the modern conception of self and world, of thought and matter was premised on their negation.

Descartes's own worldview would imply the undoing of all three assertions: contra (1) the immediate objects of thought, namely the *ideas*, are prior to anything that may subsist externally, in the paradigm of the wax in *Med.* II. Contra (2), human souls can in fact know what they consist of in even *in vita præsentia*; and finally, contra (3), they could in fact demonstrate the immortality of the soul by natural reasons. But to set up these three postulates within a basic scholastic framework that any reader could relate to, Descartes would need to renegotiate the medieval boundary that separated thought from matter in correspondence with the boundary that separated self from the world. In fact he aimed to align one distinction with the other, so that *the self begins exactly where matter ends, and the world ends exactly where thought begins*. In anticipation of this chapter's conclusion, the new state of conceptual equilibrium achieved with these reformed distintions of self–world, matter–thought made possible in *vita presentia* something that was formerly possible only *in vita altera*: the *cogito*.

III.4 Immortality Ambiguous

By identifying it as a naturally embodied form, for one, Aquinas included the soul in all those beings said *sicut simitas*; a *forma corporis* as opposed to a *forma subsistens or separata*. A God's point-of-view into the human soul, would show its natural affinity to the body [*aptitudino et inclinatio naturalis ad corporis unionem*][224] in the same manner one could read off in the essence of fire its natural tendency to ascend, or, alternatively, read off in the essence of a stone its natural tendency to descend. Along the same lines, the human soul is naturally embodied in the manner a stone is naturally descending, even if that tendency is at times frustrated, while the angelic soul is more like a naturally weightless body. In a way, the human soul is to the angelic mind, what a stone is to aether. But like all things that exist in matter—judging from the restricted view of our enmattered forms of perception—we can only approach the human soul through sensible experience and only by turning to the phantasms [*convertendo se ad phantasmata*]. In *vita præsentia*, the essence of the soul cannot be determined absolutely, so its fate too cannot be spelled out with certainty (Ch. III, §2).

We have already seen that the intellective part of the soul was such that did not require any corporeal organ *per subjectum*, like all other faculties of the soul do, though it did require bodies *per objectum*, insofar as it can only understand by turning to phantasms.[225] So though the soul is said to *subsist in* its act of understanding that uses no corporeal organ, the human being

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[224] "[S]ecundum se convenit animæ corpori uniri, sicut secundum se convenit corpori levi esse sursum. Et sicut corpus leve manet quidem leve cum a loco proprio fuerit separatum, cum aptitudine tamen et inclinatione ad proprium locum; ita anima humana manet in suo esse cum fuerit a corpore separata, habens aptitudinem et inclinationem naturalem ad corporis unionem" (Q76.A1, ad 6); "[P]er rationem suæ naturæ corpori unitur; sicut nec levis natura mutatur cum est in loco proprio, quod est ei naturale, et cum est extra proprium locum, quod est ei praeter naturam" (Q89.A1, co 2).

[225] In the familiar terms used in Pomponazzi's treatise: *sicut obiecto* and *sicut subiecto.*

was *not identical* to it, as the separate intelligences are, much less did it *consist in* it, like the *actus purus*. Even though the human composite did rely on an incorporeal faculty for its most characteristic function, since it did not fully consist in it, it was not sufficient for proving immortality by natural reason alone, without recourse to the promise of a divine suspension of the soul's natural *inclinatio* for embodiment. Since the soul is not naturally immortal then, its immortality would require a supernatural suspension by God of its physical conditions of subsistence. In the Thomist version of the purgatory, as we saw, the human soul will instead be miraculously suspended from material reality, i.e. out of the "natural element" of its intellect—as if one were assisted into holding their breath indefinitely—until the time of Resurrection where it gets plunged again into the *same* body in its glorified form.

Ultimately, the inner tensions of this view reveals a deep-seated antinomy between: (1) the need to affirm the body for the good of the soul [*propter melius animæ est ut corpori uniatur*, (Q89.1, co 4)]; and by extension, (2) to pose the corporeal world as the connatural object of the human intellect [*connaturale est intellectui nostro, secundum statum praesentis vitae, quod ad materialia et sensibilia respiciat* (Q89.A2, c. 2)], and at the same time: (3) make it separable from its body; (4) and maintain that God does not act against nature [*Deus, conditor et creator omnium naturarum, nihil contra naturam facit* (Q105.A6, obj. 1)].[226] One cannot just place the lunged creature into the element that is naturally adapted to, i.e. oxygen, and at the same time hope it will be naturally capable of existing in the void.

In a manner that would become so typical of subsequent scholastic dialectics of distinction to the point of abuse, Thomas attempted to avoid the oxymoron by recognizing (A) two dif-

[226] Quoting from Augustine, XXVI *Contra Faustum*.

ferent *modi essendi* of the soul and (B) two different forms of *præter naturam*: (A) The soul has one mode of being when joined in the body and another when separated from it. In fact it may alternate between these two *modi essendi* without overstepping its nature just as a heavy object may be moved in and out its natural place while retaining its earthy nature.[227]

Aquinas offers in support Aristotle's passage from *Physica* II that deals with the subject matter of natural philosophy. The purview of the natural philosopher extends to the specific ends of each object [*τοῦ τίνος [γὰρ] ἕνεκα ἕκαστον*] and especially to species that are always found in matter though they can be considered separately from it [*ἅ ἐστι χωριστὰ μὲν εἴδη, ἐν ὕλῃ δέ*].[228] Likewise, the human soul was claimed to be both separate and embedded in matter [*anima humana, est quidem separata, sed tamen in materia* (Q76.A1, ad 1)]. Aristotle's passage deals with the epistemic side of a separable aspect in nature, not its real distinction from its *substratum*. But Aquinas argues, from the epistemic possibility of studying a function of the embodied soul in isolation of the actual structures that support it—i.e. what we would now call a functionalist approach to intelligence—to the ontological fact that, so far as it discharges such function, it *may exist as* separated. Presumably, we need to connect this passage with an earlier one in *De Anima* I that claims a soul can be separated only to the degree that one of its functions or affects are proper to it [εἰ μὲν οὖν ἔστι τι τῶν τῆς ψυχῆς ἔργων ἢ παθημάτων ἴδιον, ἐνδέχοιτ' ἂν αὐτὴν χωρίζεσθαι· εἰ δὲ μηθέν ἐστιν ἴδιον αὐτῆς, οὐκ ἂν εἴη χωριστή (*De Anima* I. 403 a10-12)]. Somehow, we are in a position to judge the separability of a form, an act or a passion, based on

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[227] Notice I am using a metaphor based on the opposite quality of heaviness instead of Aquinas's lightness, which I find more suggestive of embodiment: "Habet autem anima alium modum essendi cum unitur corpori, et cum fuerit a corpore separata, manente tamen eadem animae natura; non ita quod uniri corpori sit ei accidentale, sed per rationem suae naturae corpori unitur; sicut nec levis natura mutatur cum est in loco proprio, quod est ei naturale, et cum est extra proprium locum, quod est ei praeter naturam (Q89.A1, c2.)."

[228] Citing *Phys*. II, 2 194b 8-15: "μέχρι τοῦ τίνος [γὰρ] ἕνεκα ἕκαστον, καὶ περὶ ταῦτα ἅ ἐστι χωριστὰ μὲν εἴδη, ἐν ὕλῃ δέ."

how well it lends itself to a proper study in isolation from its *substratum*, as the bronze circle.

(B) And though it appears that God acts *contra naturam* to suspend the soul into forced immortality, there are two ways to understand the *præter naturam*:[229] cases like carrying some water above the line where the designated *stratum* of water meets the designated *stratum* of air, are in fact against nature [*contra naturam*] because the agent of that carrying is not also the author of the water's inner tendency to rest at its natural place, amid earth and air. In constrast, when the sea ebbs and flows by the influence of the celestial bodies, though driven *beyond* its natural motion [*præter naturam*], the sea does not also go *against* its nature because the celestial bodies are actually responsible for impressing this natural inclination to inferior bodies [*ex impressione caelestis corporis*] in the first place. Thomas here presumably refers to a physical theory that takes the stratification of the five into their natural places as a product of celestial influence. Similarly, from the point of view of a creator who endowed the soul with such *inclinatio naturale* to embodiment, suspending the soul at will from its own "natural place" should not be considered an act *against* nature, but rather *beyond* it.

As we move forward into the century preceeding Descartes's own we witness these caveats in Thomas's system call out for revision all the more urgently. In response to the new wave of Averroism that was taking over the faculties of the university of Padua at the turn of sixteenth century the Lateran Council session VIII of December 10th 1513, condemned all those

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[229] [Note: I edited Thomas's analogy to have the same element be subject to the two different forms of *præter naturam*:] "Ad primum ergo dicendum quod, cum aliquid contingit in rebus naturalibus praeter naturam inditam, hoc potest dupliciter contingere. Uno modo, per actionem agentis qui inclinationem naturalem non dedit, sicut cum homo movet corpus grave sursum, quod non habet ab eo ut moveatur deorsum, et hoc est contra naturam. Alio modo, per actionem illius agentis a quo dependet actio naturalis. Et hoc non est contra naturam, ut patet in fluxu et refluxu maris, qui non est contra naturam, quamvis sit praeter motum naturalem aquae, quæ movetur deorsum; est enim ex impressione caelestis corporis, a quo dependet naturalis inclinatio inferiorum corporum (Q105.A6, ad 1)." Cf. Q89.A1, ad 3: "

who "insist that the intellective soul is mortal, or that it is unique in all human beings, and those who place this matter into doubt …"[230] and urged philosophers to find proofs about the soul's immortality within the bounds of natural reason. Pietro Pomponazzi was a philosopher who internalized these debates from his *alma mater*, and in an attempt to settle them while distancing himself from the Averroist panpsychism of his former teachers, he produced his 1516 treatise *De immortalitate animae*. In this short treatise, he claimed that the grand intellectual achievement of the High Middle Ages, *the* Thomist *synthesis of* Christian *eschatology and Aristotelian natural philosophy was unstable, and that the immortality of the soul could not be definitively argued for without transgressing either the natural limits of human knowledge, or the interpretative limits of* Aristotle*'s word*. Having considered both possibilities—of either having a personal yet mortal soul, or being part of an impersonal yet immortal soul, Pomponazzi declared the immortality of the personal soul fell under the category of 'neutral problems.' Like that about the eternity of the world, it is the kind of problem that can be argued for either way and is liable to indefinite disputes. If the soul was ever to be found immortal it would only be through divine revelation.

As he himself made known in his letter to the Sorbonne, Descartes was keen to present the project of the *Meditationes* as a definitive response, no matter how overdue, to that original plea the Council (1513) directed to the philosophers to find solid proofs for the immortality of

[230] "[C]upientes hoc sacro approbante concilio damnamus et reprobamus omnes asserentes animam intellectivam mortalem esse aut unicam in cunctis hominibus et haec in dubium vertentes cum illa non solum vere per se et essentialiter humani corporis forma existat sicut in canone felicis recordationis Clementis papæ v praedecessoris nostri in generali Viennensi concilio edito continetur verum et immortalis et pro corporum quibus infunditur multitudine singulariter multiplicabilis et multiplicata et multiplicanda sit" [Documenta Catholica Omnia, Concilium Lateranense V [1512-1517] (available online at https://www.documentacatholicaomnia.eu/04z/z_1512-1517__Concilium_Lateranense_V__Documenta__LT.doc.html)]

the soul.[231] Undertaking this task, Descartes had to reinvent the soul as a complete substance, the Cogito being the first step towards this direction.[232]

[231] V Lateran Council, from the Bull *Apostolici Regiminis*,
SESSION 8, n. 1-14 (19 December 1513): "Moreover we strictly enjoin on each and every philosopher who teaches publicly in the universities or elsewhere, that when they explain or address to their audience the principles or conclusions of philosophers, where these are known to deviate from the true faith -- as in the assertion of the soul's mortality or of there being only one soul or of the eternity of the world and other topics of this kind -- they are obliged to devote their every effort to clarify for their listeners the truth of the christian religion, to teach it by convincing arguments, so far as this is possible, and to apply themselves to the full extent of their energies to refuting and disposing of the philosophers' opposing arguments, since all the solutions are available." *Decrees of the Ecumenical Councils*, ed. Norman P. Tanner (London: Sheed & Ward; Washington, DC: Georgetown University Press, 1990) I: 606.

[232] Thus Thomas Browne writes "that <the ſouls of men> ſubſiſt beyond the body, and outlive death by the priviledge of their proper natures, and without a Miracle" *Religio Medici* (London; R. Scot, T. Baſſet, J. Wright, R. Chiſwell, 1642, 1682) p. 86, §37.

III.5. Cogito Impossible in Vita Praesentia, Made Possible in Altera

The fact of self-understanding, was neither unattested nor philosophically unutilized before the time of Descartes, surely not for Aquinas.[233] Indeed the normative view for *visio intellectualis* which was Augustine's term of the highest form of knowledge vision in his *Genesi ad litteram* XII.24[234] was the way an intelligence could know itself by its own essence (as disembodied soul or angel).[235] Most importantly, it forms a crucial and self-evident datum for Aquinas's argument against the Averroist position on the unicity of the intellect. It appears in Quæstio 76 of the *Summa* as a *datum*: one understands himself as understanding [... *oportet quod inveniat modum quo ista actio quæ est intelligere, sit huius hominis actio, experitur enim unusquisque seipsum esse qui intelligit* (Q76.A1, c. 2); or an intellectual act that Socrates claims as his own [… *actio intellectus sit actio Socratis* (*ibid*. c. 4)]. All this is claimed in the course of the main argument in support of the view the *intellectus* is the form of the body [*intellectivum principium uniatur corpori ut form*], and against the Averroist monopsychist hypothesis of one possible intellect among all human souls (c. 4). Thomas's position is put forward as the best solution to harmonizing the Aristotelian theory of the soul as a *forma corporis* with the realization it is the *same* self sensing through the body and understanding through the intellectual part, taken as self-evident. Athough the Platonic position which ascribed, at least so far as Aquinas could report,

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233 It is not by accident that Nicolas Autrecourt in all his radical scepticism, recognized in Aristotle the claim in the knowledge of a substance only insofar as his own soul is concerned.

234 *Corpvs Scriptorvm Ecclesiasticorvm Latinorvm*, XXVIII, sect III, pars 4: pp. 416-418.

235 The normative view for intellectual vision was the way an intelligence could know itself by its own essence (as disembodied soul or angel): "… eorum quæ sunt in anima per sui essentiam, ut dicitur in Glossa II ad Cor. XII" (Q57.A1, obj 2). Or, referencing Augustine's *Gen*. *ad Lit*. XII, 24: "… visione intellectuali videntur ea quæ sunt in anima per suam essentiam. Sed visio intellectualis est de rebus intelligibilibus, non per aliquas similitudines, sed per suas essentias…" (Q12.A11, obj. 4). To which follows the response: "Sic ergo essentiæ rerum materialium sunt in intellectu hominis vel angeli, ut intellectum est in intelligente, et non secundum esse suum reale. Quaedam vero sunt quæ sunt in intellectu vel in anima secundum utrumque esse. Et utrorumque est visio intellectualis" (Q57.A1, ad 2).

both sensing and understanding to the same soul would in fact have no problem in explaining this *datum*, it would render corporeal existence extrinsic to the soul's operation. In the end, it is only the Aristotelian hypothesis of the intellect as a *forma substantialis corpori* that can explain how the action of sensing, of imagining as well as of understanding can be ascribed to the same self [*persona*], regardless of whether these faculties presuppose corporeal organs or not.

By way of a possible objection to his thesis, Thomas mentions Augustine's claim that the mind knows itself, *because* it is incorporeal.[236] Thomas certainly believes a self-subsisting cognitive power (such as the angels) is naturally self-conscious:

> … in so far as the form perfects the matter by giving it being, it is in a certain way diffused in it; and it returns to itself in so far as it has being in itself [*inquantum vero in seipsa habet esse, in seipsam redit.*] Therefore those knowing powers which are not subsisting but are the acts of organs, do not know themselves, as is clear in each of the senses; but those knowing powers that are self-subsisting, know themselves [*virtutes cognoscitivæ per se subsistentes, cognoscunt seipsas*].[237]

Supposing the capacity of a creature to self-reflect [*in seipsam redit*] relates to the degree it has being in itself [*in seipsa habet esse*], (whatever that means), Thomas can posit a gradient of the power of self-knowledge in reverse proportion to the matter it contains, in parallel that is with the gradient of cognitive power. Indeed, he tells us later there are different *gradus* of self-knowledge in proportion to how much the act of knowing is completed by their own essence, i.e. the degree to which they fully consist in this act [*nihil cognoscitur nisi secundum quod est actu*], and the degree to which they understand the world through their essence.[238] This suggests the analogy that, just as prime matter is intelligible only insofar as it is related to form [*secundum*

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[236] Q89.A1, obj 1: *mens seipsam novit per seipsam, quoniam est incorporea* (*De Trin*. ix, 3)]. Cf. *Liber de Causis*.

[237] Q14.A2, ad 1.

[238] Q87.A1, c & Q87.A3.

proportionem ad formam, ut dicitur in I Physic.], immaterial beings are intelligible to themselves by their essence [*per suas essentias*] only insofar as they become actual by these essences.

> Unde et in substantiis immaterialibus, secundum quod unaquaeque earum se habet ad hoc quod sit in actu per essentiam suam, ita se habet ad hoc quod sit per suam essentiam intelligibilis.[239]

If we return to the original measure of nobility in physical forms by how much the more extensive and far-reaching their operation is (from Ch. II), we find the most noble of the *souls*, the human soul, enjoying a kind of infinity in the indefinite extension of a universal. But if the kind of infinity the soul ascends to is rooted in its indeterminacy, in its ability to become all things [**C5:** *ἡ ψυχὴ τὰ ὄντα πώς ἐστι πάντα*, (*De Anima* III, 431b 20)] it needs to a certain degree *to not actually be anything*; to be potential by its very nature. In fact, Thomas affirms that, *mutatis mutandis*, mind is functionally similar to prime matter in relation to its object.[240] Like prime matter its a 'potential anything' but 'actually nothing.' And like prime matter too, it is unknowable *per se*, but only insofar as it is occupied by one form or the other.

As Roger Ariew confirms this as a standard placitum of scholastic philosophy.[241] He quotes from Eustachius's *Summa*, which Descartes once praised as "the best book of its kind ever made:"[242]

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[239] Q89.A1, c. 1.

[240] "Intellectus est in potentia ad omnes formas intelligibiles, nullam earum habens in actu, sicut materia prima est in potentia ad omnes formas sensibiles, et nullam earum habet in actu" (*QdA* A2.17). Cf. *De Ent*. Ch. IV.10; *ST* Ia Q14.A2, ad 3; Q55.A2; Q87.1, ad 1.

[241] Roger Ariew, *Descartes and the Last Scholastics*, p. 201, note 56.

[242] Letter to father Mersenne, 11 November 1640 (AT III: 232 CSMIII: 156).

Prima aſſertio. Intellectus priùs cognoſcit res alias quàre ſeipſum. Ratio eſt, quia cognitio directa prior eſt quàm reflexa; intellectus autem cognoſcit res alias à ſe directa cognitione: ſeipſum verò nonniſi reflexa, vt patet ex præcedendi quæstione.	The intellect knows other things before it knows itself. For direct knowledge is prior to reflexive knowledge, and the intellect knows things other than itself by direct cognition, while it knows itself only by reflexive cognition.... The intellect knows material substances before it knows immaterial and spiritual ones . . . .
Eustachius à Sancto Paulo, *Physica* III, tract. 4, disp. 2, quaest. 6 in *Summa Philosophiæ Quadripartita,* (Paris: apud Carolvm Chastellain, 1609), p. 427.	trans. in Ariew, *Descartes and the Last Scholastics*, p. 201, note 56.

Like other things then, self-knowledge comes in degrees and though angels who subsist in their intellects know themselves *per sui essentiam*, humans know their intellect only through their act, *per actus*.[243] Their potential intellect needs to be activated to be known, that is by taking phantasm as its objects, in the same way a featureless mirror assumes visible being only insofar as it reflects the object placed in front of it. Though incorporeal as an act, the intellect needs to be activated by this or that species [*per conversionem intellectus ad phantasmata*]. It is understood only insofar as it is activated sequentially by the species it abstracts from the sensible things [*Unde ex seipso habet virtutem ut intelligat, non autem ut intelligatur, nisi secundum id quod fit actu* (Q89.A1)].

Occupying the lowest sphere the human intellect is only a potentiality in regards to intelligible beings, just as primary matter is a potentiality in regards to all sensible forms. Their essence does not complete the act of their understanding because they do not subsist in it, just as prime matter does not subsist on its own. So humans *cannot* understand themselves by their es-

[243] "Sic igitur in sua essentia consideratus, se habet ut potentia intelligens. Unde ex seipso habet virtutem ut intelligat, non autem ut intelligatur, nisi secundum id quod fit actu (Q89.A1)."

sence. Angels however do understand themselves by their own essence, even if they know everything else only through *similitudines* [*se habet et ut intellectus, et ut intellectum. Unde angelus suam essentiam per seipsum apprehendit* (89.A1, c. 2)]. Without form, like prime matter, the intellect is not, by its own self, any particular thing (*τόδε τι*), aside from an assertion of bare existence. If not activated by a phantasm, or configured by external bodies *human intellectus* is as invisible to itself as it is indeterminate. In fact, even recalling a species already acquired in the *intellectus passibilis* relies on *imagines*, like the use of illustrative examples in teaching or rhetoric. But even more crucially, we understand such abstract things as a triangle only per accidens, by imagining a particular one in intelligible extension. So in the absence of this corporeal imagination, that screen, as it were, where things immaterial assume a temporary intelligible matter (and become this or that triangle) the human intellect could not think of anything, much less its own self.

Left to its own natural devices a human intellect cannot even understand (only sense) the disposition of individuality material beings have *extra animam*, much less understand its own being *per suam essentiam*. And since it is the phantasms that allow the soul to reflect on understanding in its singular acts, no human mind would be able to see oneself as it exists in all its particularity. Without the deliverances of the imagination, the pre-Cartesian human intellect would be lost in a sea of indeterminateness, as it were, not being able to think any one object in particular, in concrete terms. For even if it had acquired intelligible species and retained them in intellectual memory, it would still need phantasms to understand them. In other words, the act of understanding was perceived to be this-or-that act of mine, only on the basis of this-or-that object that ultimately originates in sensing the particular.

What came so naturally to Descartes and the Cartesian school of thought down to Berkeley and beyond, positing inner objects of immediate perception, the *ideas*, was inconceivable in the premodern era.[244] Simply by sensing or understanding, even of nonexisting states of affairs, the human self is already found tending towards matter. The world of material particulars takes precedence over the knowledge of the self, which latter can only occur as a secondary *reflexio* on one's own acts. The self relies on the phantasms drawn from experience to understand its act by its own essence.

> [T]he intellect can understand its own act. But not primarily, since the first object of our intellect, in this state of life [*secundum praesentem statum*], is not every being and everything true, but being and true, as considered in material things [*ens et verum consideratum in rebus materialibus*], as we have said above (Q.84, A.7), from which it acquires knowledge of all other things.[245]

However, though the human soul cannot understand itself *per suam essentiam* in the present life it can at least understand its act of understanding *per suam præsentiam*, the intellect as it gets activated by this or that object, otherwise it would not be able to either predicate the act to itself ["the same self that senses also understands" statement], or conclude on its incorporeal function.

To the degree that act uses no corporeal organ the Aristotelian principle that identifies the intellect and the intelligible object in things devoid of matter (**C3**) holds true.[246] But a self-reflective act of the intellect is not equivalent to knowing one's composite self, because it does not fully consist in it, in the same manner the physician of *Physica* II does not consist in the act of heal-

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[244] I rely on Robert Pasnau's analysis *After Certainty: A History of Our Epistemic Ideals and Illusions* (Oxford, UK: Oxford University Press, 2017).

[245] "… nec primum obiectum intellectus nostri, secundum praesentem statum, est quodlibet ens et verum; sed ens et verum consideratum in rebus materialibus" (QA3, ad 1)].

[246] "ἐπὶ μὲν γὰρ τῶν ἄνευ ὕλης τὸ αὐτό ἐστι τὸ νοοῦν καὶ τὸ νοούμενον" (*De Anima* III.4, 430 a3-4)]

ing. And while the mere presence of the mind suffices for the former, the latter requires due inquiry into its nature.[247] Anticipating the charge of going against St. Augustine, who seemed to allow the mind to know its own nature, Thomas clarifies his position:

> Augustine then did not mean that the soul of itself knows its own essence. So then, according to the thought of Augustine, our mind of itself knows itself, in as much as it knows concerning itself that it exists: for by the very perceiving of itself to act it perceives itself to be. But it acts of itself. Therefore of itself it knows concerning itself that it exists.[248]

But the human soul can know itself *per sui essentiam* only in the *vita altera*, whereas separated from the body it would subsist in the intellective act by supernatural grace, as other intelligences subsist naturally.[249] Since *all knowing powers that are self-subsisting must know themselves*, according to the above, the human soul cannot attain absolute self-knowledge any time prior to the next life.

By way of recapitulation, we learned that the material conditions contituent of humans and their special object of cognition, a world *extra animam*, were such that the mind could not reflect on its pure self. Unless actively engaged in sensation or imagination the mind is invisible to itself. It is explicitly mentioned in the *De Sensu* and *De Memoria*, as an appendix to the *De Anima*, that man can understand nothing without a *phantasm* or *mental image* [*Nihil potest homo intelligere sine phantasmate*].[250] This applies to abstract species like those of mathematics, ab-

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[247] "Est autem differentia inter has duas cognitiones. Nam ad primam cognitionem de mente habendam, sufficit ipsa mentis praesentia, quæ est principium actus ex quo mens percipit seipsam. Et ideo dicitur se cognoscere per suam praesentiam. Sed ad secundam cognitionem de mente habendam, non sufficit eius praesentia, sed requiritur diligens et subtilis inquisitio" (Q89.A1, c. 2).

[248] *Summa contra Gentiles,* III.XLVI.

[249] For the opposite view see Tommaso Campanella, *Vniversalis Philosophiæ, sev Metaphysicarvm rerum ...* (Parisiis, 1638), 1: Part I, Lib. I, cap. i, art. 9; p. 20.

[250] Aquinas, *In Aristotelis libros De sensu et Sensato, De memoria et Reminiscentia Commentarium*, ed. R. M. Spiazzi (Turin-Rome, 1949), pp. 85ff.

stract universals such as beauty and virtue, as much as it applies to understanding intelligence *per se*, be it human, angelic, or divine. Without the intuition of particular existence that humans can only derive from the external world, it would be lost in a sea of universals as it were. Drawn out of the world, and outside the input of actual sensation (this feeling of warmth here and now [*hic et nunc*], or this light emitted there, at that time), the pre-Cartesian mind would never be apprised of *entelecheia*, of something that actually exists as a particular—let alone identify itself as one as in the *Sum, Existo* or *sum res cogitans*. So when Descartes asserts in the beginning of *Med.* V, he can understand a chiliagon without conjuring a picture on it in his imagination, or even before that, that one can reflect on one's own attribute of thought, besides any representational content, he goes directly against this tradition. In the end, the *Cogito*, understood as knowing oneself through its essence [*per sui essentia*] such knowledge of the self was reserved for the prelapsarian man or the glorified man, but not the 'wayfarer' [*viator*] of this life.

Consider Englishman William of La Mare, graduated as a Master regent in Paris in c. 1274, who headed the Franciscan reaction to Aquinas and the Dominican order, writing a few years after 1277 condemnations in Paris and later Oxford that: "According to Thomas, the separated soul—like the angles and God himself—would not know particulars. Therefore it would not know Christ's passion or its own individual sings, its suffering from the "corporal fire" required by Scripture would be allegorized into mere mental impediment. The separated soul would be similar—even equal—to other souls, for it would be an intellect knowing itself and other souls as intellects."[251]

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[251] William de la Mare, *Declarationes Magistri Guilelmi de la Mare O.F.M. De Variis Sententiis S. Thomae Aquinatis*, ed. Francis Pelster (Münster: Aschendorff, 1956, pp. 21, 22, 26-28. Caroline W. Bynum's account of the *Declarationes* in her *The Resurrection of the Body in Western Christianity, 200-1336* (New York: Columbia University Press, 1995) p. 274.

III.6 A New Subiectum

On the side of 'thought' the innovation of Descartes is clear: he took the old notion of *mens*, that was associated with the will [*voluntas*] and the intellect [*intellectus*], and turned it into a *res*, a self-subsistent thing.

It is in fact due to the new demands for self-evident existence, that we find the post-Cartesian self all-the-more contracted into all that which it can be directly conscious of. So, though the subtitle of the *Meditationes* (1641) pledges to demonstrate the immortality of a soul in terms familiar to the reader [*In qua Dei existentia et animæ immortalitas demonstrantur*]—it becomes clear that the traditional profile of *anima*, in the first meditation, as the subject where the actions of nutrition, movement, sensation, thinking are to be referred to [*nutriri, incedere, sentire, & cogitare* (AT VII: 26)], is superseded by *mens* as the subject of the conscious, first-personal point-of-view of sensations, passions, volitions etc. So, the *mens*, *animus*, *intellectus*, *ratio*—the meanings of which the meditator admitted to not knowing before [*voces mihi priùs significationis ignotae*] are all reduced to a *res cogitans*.

The reason Descartes uses *mens* over *anima*, as he himself relates in the *Second Replies*, is that the *anima* had been used equivocally and often taken for a corporeal thing [*quoniam animæ nomen est aequivocum, & saepe pro re corporea usurpatur* (*Secundæ Responsiones*, AT VII: 161)]. Indeed, as referenced in the preceding sections, the classic Thomist theory of the human soul considered it both separable, in its capacity to understand [*intelligere*], but also enmattered, in its capacity to communicate life to a body (Q76.A1, ad 1)]. For this very reason the *mens* was traditionally meant for angelic minds that entirely consist in their intellective power [*vis*, *virtus*].

> [I]n angelis non est alia vis nisi intellectiva, et voluntas, quæ ad intellectum consequitur. Et propter hoc angelus dicitur mens vel intellectus, quia tota virtus sua in hoc consistit. Anima autem habet multas alias vires, sicut sensitivas et nutritivas, et ideo non est simile.[252]

In other words, though the pre-Cartesian human mens was intimately linked to the soul as one of its parts or powers [*pars or potentia animae*];[253] and the pre-Cartesian angel was associated with a subsistent mens, the Cartesian human *mens* becomes a *res* or a *substantia cogitans*, i.e. consisting entirely in *cogitatio*.

It might be useful to trace back certain elements of the new mental taxonomy to their pre-modern counterparts. We saw that Thomas employed *cognitio* as the genus term that encompasses *intelligere* and *sentire*.[254] In that sense the cognitive ability scaled from the animal to the human, the angelic, up to God. We saw it was minimally defined as the power to contain more forms than one's own, and of receiving them *sine materia*. But applied thought to sense was attributed to the soul-body complex as its *per se* subject, and understanding was attributed to the soul in itself. In other words, a soul sensed and understood by different compartments of itself. Instead of the Thomist *cognitio*, Descartes uses *cogitatio* in the *Meditationes* as the broader term that encompasses "everything in us we are immediately conscious of" [*illud omne quod ſic in nobis eſt, ut ejus immediate conſcii ſimus*, AT VII: 160; CSM II: 113].

In talking about faith and thinking, Thomas had used *cogitare* to define faith as "thinking with assent." In this sense *cogitare* it seems to have conveyed a character of ambiguity, or a de-

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[252] *ST* Ia.79.A1, ad 4. Also Q54.A5, c2: "Et hoc etiam Commentator dicit, XII *Metaphys*., quod substantiæ separatæ dividuntur in intellectum et voluntatem. Et hoc convenit ordini universi, ut suprema creatura intellectualis sit totaliter intellectiva; et non secundum partem, ut anima nostra. Et propter hoc etiam angeli vocantur intellectus et mentes, ut supra dictum est."

[253] "Et sic unum genus potentiarum animæ est pars rationalis, quæ hic mens dicitur, comprehendens voluntatem et intellectum, quæ quidem pars animæ operatur absque organo corporali" (Aquinas, *Sentent.*, lib. I, dist. 3, qu. 3, art. 1.). As cited in Étienne Gilson, *Index Scolastico-Cartésien* (Paris, F. Alcan, 1912) p. 179, No 281.

[254] *Comm. De Anima* III, chapter III, Lectio 4, 622.

liberative stage before the actual assent. Elsewhere in Q57.A4, obj. 1 by *cogitationes cordium* he was referring to the inner, more intimate thoughts that not even angels can penetrate, only God, and much less Adam (cf. Q94.A3-4). In Q111.A2, ad 2 the devil is said to not be able to channel *cogitationes* but merely incite them (*incedere* by Damascenus). In fact, we are told it is only by external speech that man can reveal his own *cogitationes* to angels (Q117.A2, c), just as a man can know merely *in suo effectu* the thoughts of other men (Q57.A4, c.). These inner thoughts are said to be hidden from public view in two ways, by matter and by the will of the possessor.[255] The overall impression is that the *cogitatio* was reserved by Aquinas for utterly private acts of thought. So the term *cogitatio* that Descartes will ultimately posit as the principal attribute of thought the meditator would have formerly used to refer only to those most intimate thoughts of the heart.[256]

Interestingly, the medieval doctors situated the seat of cogitation at the center of the brain, as a mediator between matter and thought, the particular and universal. It rendered possible the meaningful collation of universal and particular content into singular statements such as

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[255] "Ad primum ergo dicendum quod modo cogitatio unius hominis non cognoscitur ab alio, propter duplex impedimentum, scilicet propter grossitiem corporis, et propter voluntatem claudentem sua secreta. Primum autem obstaculum tolletur in resurrectione, nec est in angelis. Sed secundum impedimentum manebit post resurrectionem, et est modo in angelis. Et tamen qualitatem mentis, quantum ad quantitatem gratiæ et gloriae, repraesentabit claritas corporis. Et sic unus mentem alterius videre poterit" (Q57.A4, ad 1).

[256] More consistently in other places the *vis cogitativa* or *ratio particularis* is taken as the human counterpart of the vis aestimativa, and is said to somehow operate on individual intentions ["Loco autem aestimativæ virtutis est in homine, sicut supra dictum est, vis cogitativa; quæ dicitur a quibusdam ratio particularis, eo quod est collativa intentionum individualium." (Q81.A3, c)] by the "conferre et componere et dividere" (Q78.A4, obj. 5); "[Q]uæ in aliis animalibus dicitur aestimativa naturalis, in homine dicitur cogitativa, quæ per collationem quandam huiusmodi intentiones adinvenit. Unde etiam dicitur ratio particularis, cui medici assignant determinatum organum, scilicet mediam partem capitis, est enim collativa intentionum individualium, sicut ratio intellectiva intentionum universalium" (Q78.A4, c. 5).

"this is a human."[257]

It is as early as *Regula* XII that Descartes perceives the *vis cognoscens* as single and one and the same power regardless of what it is occupied with, and of which nothing corporeal can provide insights into. While it is said that it understands [*intelligere*] when acting on its own (AT X: 416). In the taxonomy of the *Principia*, however where *perceptio* and *volitio* are the two proper operations of the mens or substantia cogitans the *sentire*, *imaginari* and pure *intelligere* become species of the operation of the intellect.[258] In other words, by framing all previously non-intellectual faculties of the soul as different modes of intellection—thus making cogitatio the all-encompassing attribute of all mental activity, Descartes pushes the reader to seek conceptual equilibrium in a taxonomy that frames the human mind in the same terms as the mind of the pre-Cartesian angel.Effectively, to a sixteenth-hundreds reader of Descartes the *sum res cogitans* in terms of the old discourse would either be available to a skeptical angel, or, since the meditator clearly senses as much as he understands, the model of a human being in its glorified state.

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[257] In other places he refers to Augustine's view that: "[v]erbum autem in anima nostra sine actuali cogitatione esse non potest, ut Augustinus dicit XIV de Trin." (Q93.A7, c) and later, A7, ad. 3, we are said to cogitate what we say in our interior private language [*cogitamus enim omne quod dicimus etiam illo interiori verbo quod ad nullius gentis pertinet linguam*]. Alternatively, we find *cogitare* in a participle form in a view that takes intelligence to be that *by which* we understand when actually thinking [*Hanc autem nunc dico intelligentiam, qua intelligimus cogitantes* (Ibid.)]

[258] Descartes, *Principia* I: XXXII, ILVIII, CSM I: 204, 208-209; AT VIII-1: 17, 23.

III.7 New Obiectum Proprium

Changes in discourse about the faculties of the soul also imply changes in their proper *obiecta*.

As Robert Pasnau has so carefully noted (*After Certainty* (2017), under the innocent pretense of a linguistic preference of 'idea' as the form of anything that we are immediately conscious of, a big step is taken (or at least signaled) toward the interiorization or privatization of the sensible features of the world, and, for our purposes, toward the eventual vanishing of matter.

Though Cartesian *ideæ* were strictly conscious states, *species* and *intentiones* could in fact be found across the unconscious media they were transmitted, from their *fons emanationis* to the receiver. Secondly, as previously discussed, the *intentiones intelligibiles* were primarily directed to the external object and only secondarily to the act of understanding, while Cartesian *ideæ* denoted formally the general object of apperception, i.e. any object that occupies the conscious self at a given moment.[259]

As we saw in Ch. II, there was order of perfection according to which the proper and natural object [*obiectum proprium* or *connaturalis*] differed between angels and humans. On the one side of the spectrum, the proper object of an angelic intellect, totally separated from the body, is its own self as a subsistent species [a *substantia intelligibilis a corpore separata* (Q84.A7, co)]. It is within that perfectly intelligible and immaterial *eidos* that angels subsist in that they gain knowledge of all other material and spiritual things in varying degrees of integration, universality and economy.

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[259] *Secundæ Responsiones*, AT VII 160; CSM II: 113: "Cogitationis nomine complector illud omne quod ſic in nobis eſt, ut ejus immediate conſcii ſimus. Ita omnes voluntatis, intellectûs, imaginationis & ſenſuum operationes ſunt cogitationes."

On the other side of the spectrum however, the proper object of the human intellect, as the *coniunctus corpori* that it is, is a nature existing in corporeal matter as an individual [*quiddi-tas sive natura in materia corporali existens* (Q84.A7, c.)]; *ea quæ sunt extra* (Q94.A2, c. 3)]. Though humans cognize by those abstract and non-subsistent *species*, sensible and intelligible, they can only secondarily objectify them in an act of self-reflextion. So when Thomas considers whether the primary object of the intellect is the species, or whether species relate to the human intellect *sicut id quod intelligitur*, he flatly rejects it lest "all the sciences not be about things existing out of the soul, but merely about the intelligible species that exist in the soul" [*scientiæ omnes non essent de rebus quæ sunt extra animam, sed solum de speciebus intelligibilibus quæ sunt in anima*][260], or agree with the Platonists that all science is about ideas.

So if the principle of operation of the pre-Cartesian human was the intelligible and sensible *species*, the principle of operation and immediate object of apprehension of the Cartesian soul is the *idea*, a term that was actually previously reserved for the contents of the divine mind. In the *Summa*, for example, a divine idea is related to a being as its cause, and a species as its effect. Responding to Thomas Hobbes, who restricted the meaning of 'idea' to the images of material things impressed on the imagination, Descartes makes the following clarification:

> [I] am taking the word 'idea' to refer to whatever is immediately perceived by the mind. For example, when I want something, or am afraid of something, I simultaneously perceive that I want, or am afraid; and this is why I count volition and fear among my ideas. I used the word 'idea' because it was the standard philosophical term used to refer to the forms of perception belonging to the divine mind, even though we recognize that God

[260] *ST* Ia Q85.A2, c 2; cf. *extra animam*, Q54.A4, co 2.

does not possess any corporeal imagination.[261]

The notion of divine *idea* was invoked as a unit in God's mind that needs to possess knowledge of everything actual or possible feature of His creation without compromising His simplicity. Aquinas differentiated the *idea* which is the thing insofar as it is that *by which* [*qua <operatum> intelligitur*] and not insofar as it is *that which* is understood [*quod intelligitur*].[262] Though an understanding of many things by many *species* would jeopardize the simplicity of the divine mind, that would not happen if it understood many things *through* his simple divine essence.[263] So far as the multiplicity is reserved to the *obiecta* of understanding, the divine intellect is simple, but not so much if He had to objectify all these beings by a multiplicity of species as *qua intelligitur*. Since the map of the entire creation is constituted in all its variety by the divine essence variously simulated, God needs to turn to His self-knowledge to understand all creation. By objectifying himself, He objectifies all other beings that can participate in Him. So, God's mind is such that there is no difference between thinking of Himself and thinking of all stuff: "God does not understand things according to an idea existing outside Himself [*res secundum*

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[261] *Third Set of Objections with Replies*, CSM II: 127; "Hic nomine ideæ vult tantùm intelligi imagines rerum materialium in phantaſîâ corporeâ depictas; quo poſito facile illi eſt probare, nullam Angeli nec Dei propriam ideam esse poſſe. Atqui ego paſſim ubique, ac | præcipue hoc ipſo in loco, oſtendo me nomen ideæ ſumere pro omni eo quod immediate a mente percipitur, adeo ut, cùm volo & timeo, quia ſimul percipio me velle & timere, ipſa volitio & timor inter ideas a me numerentur. Uſuſque ſum hoc nomine, quia jam tritum erat a Philoſophis ad formas perceptionum mentis divinæ ſigniſicandas, quamvis nullam in Deo phantaſiam agnoſcamus; & nullum aptius habebam" (*Objectiones Tertiæ*, AT VII: 181).

[262] "Hoc autem quomodo divinæ simplicitati non repugnet, facile est videre, si quis consideret ideam operati esse in mente operantis sicut quod intelligitur; non autem sicut species qua intelligitur, quæ est forma faciens intellectum in actu. Forma enim domus in mente aedificatoris est aliquid ab eo intellectum, ad cuius similitudinem domum in materia format. Non est autem contra simplicitatem divini intellectus, quod multa intelligat, sed contra simplicitatem eius esset, si per plures species eius intellectus formaretur. Unde plures ideæ sunt in mente divina ut intellectæ ab ipso" (Q15.A2, co 2).

[263] Cf. *Quæstiones Disputatæ de Veritate* , Q III; *ST*, Ia 15. A1; 44.A3; I *Sentences* 36, 2, 1; I *Metaph*., lectura 15, nn. 232—33.

ideam extra se existenm]."[264]

Ultimately, the doctrine of the divine ideas allowed the indifferent God of Aristotle caught in eternal self-contemplation, to meet the Judeo-Christian God of providence and prescience by a principle of plenitude. As an *actus purus* God can contemplate nothing other than His own self. But since there are infinite ways that divine essence may be participated by a creature with its own proper degree of perfection, God sees in and through Himself an infinity of possible beings from the Seraphim down to prime matter, contained virtually in their first cause as ideas in His mind.

Before the *Meditationes*, in the 1620s a reader would have read Bacon making a distinction between "humanæ mentis idola" and "divinæ mentis ideas" in *NO* I.XXIII[265]—obviously drawing on the classic allegory of the Platonic cave from *The Republic*, Book VII 514a–520a—contrasting empty teachings [*placita quaedam inania*] next to the true signatures and impressions left in creatures [*veras signaturas atque impressiones factas in creaturis*].

But even a few years later than the *Meditationes*, in his introduction to his *Exercitationes De Generatione Animalium* (Amsterdam, 1651) William Harvey quotes from Seneca *Epist.* 58, on the distinction between *eidos* and *idea*. Effectively Harvey is using as late as 1651, ideas to refer to that mind-independent origins of the act of representation.

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[264] "[D]icendum quod Deus non intelligit res secundum ideam extra se existentem. Et sic etiam Aristoteles improbat opinionem Platonis de ideis, secundum quod ponebat eas per se existentes, non in intellectu" (*ST* Ia.Q15.A1, ad 1). It should be noted the *ideæ* held remote overtones of a Platonic onto-epistemology where the *rationes cognoscendi* converged with the *rationes essendi*, and which after Augustine and by 12th century were becoming internalized in the mind of God, the *dēmiurge*. As such, while there was no idea of matter in Plato, and Aristotle's *primum mobile* was untroubled by matter, there was in God's mind, for Thomas, an *idea* of everything down to prime matter, which made possible what X calls the "radical intelligibility of the particular."

[265] "Non leve quiddam interest inter humanae mentis idola, et divinae mentis ideas; hoc est, inter placita quaedam inania, et veras signaturas atque impressiones factas in creaturis, prout inveniuntur."
Also: *NO* II.XVII "*... non intelligantur ea quæ dicimus (etiam quatenûs ad Naturas fimplices) de formis & Idæis abstractis, aut in materiâ non determinatis, aut malè determinatis."*

> … [T]he one is the pattern or prototype, the other the form taken from the pattern and fixed in the work; the artist imitates the one, he creates the other. A statue has a certain expression of face; this is the Eidos, the species or representation; the prototype himself has a certain expression, which the statuary conceiving, transfers to his statue: this is the idea. ... The Eidos is in the work; the idea without the work, and not only without the work, but it even existed before the work was began." … [A]rt, indeed, is the reason of the work in the mind of the artist [*ars est ratio operis, in animo Artificis.*]. On the same terms, therefore, as art is attained to, is all knowledge and science acquired; for as art is a habit with reference to things to be done, so is science a habit in respect of things | to be known: as that proceeds from the imitation of types or forms, so this proceeds from the knowledge of natural things. … In both, that which we perceive in sensible objects differs from the image itself which we retain in our imagination and memory. That is the type, idea, form informans; this is the imitation, the Eidos, the abstract species. That is a thing natural, a real entity [*res naturale*, *ens reale*]; this is a representation or similitude, and a thing of reason [*repræſentatio, ſive ſimilitudo, & ens rationis*]. That is occupied with the individual thing, and itself is single and particular; this is a certain universal and common thing.[266]

George Berkeley too thought:

> In Plato's ſtyle, the term idea doth not merely ſignify an inert inactive object of the underſtanding, but is uſed as ſynonymous with *αἴτιον* and *ἀρχὴ*, cauſe and principle.[267]

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[266] Translated by Robert Willis in: *The Works of William Harvey, MD*, [London, 1847], 156-7. The original runs as follows: "*Alterum exemplar est, alterum forma ab exemplari ſumpta, & operi impoſita: alteram artifex imitatur, alteram facit. Habet aliquam faciem ſtatua, hæc est Idos: Habet aliquam faciem exemplar ipſum, quod intuens opifex, ſtatuam figuravit; hæc Idea est. Etiamnum aliam deſideras distintionem? Idos in opere eſt; Idea extra opus: nec tantum extra opus eſt, ſed ante opus*. … ſiquidem ars est ratio operis, in animo Artificis. Quo pacto igitur ars nobis advenit; eodem omnino cognitio omnis & ſcientia acquiritur: nam ut ars circa facienda, ità ſcientia circa cognoſcenda, eſt habitus: ut illa ab imitatione exemplarium; ità hæc, à rerum naturalium cognitione procedit. … In utriſque differt id, quod in rebus ſenſibilibus ſpeculamur; à ſpectro ipſo, quod in phantasiâ, vel memoriâ retinetur. Illud exemplar, Idea, forma informans, hoc imitandum, Idos, ſpecies abſtracta. Illud res naturalis, ens reale; hoc repræſentatio, ſive ſimilitudo, & ens rationis. Illud, circa rem ſingularem verſatur, ipſumque eſt ſingulare, & individuum: hoc, univerſale quid, & commune [*Exercitationes De Generatione Animalium* (Amsterdam, 1651), *Præfatio*, p. 7-8.]"

[267] *Siris* 161, §335.

III.8 Quantity Before and After Form

There is however a realm where the necessity of premises leading to conclusions, and subjects to properties is acquired intuitively and without reliance on experience. Within a world that is otherwise non-comformable to our standards of certainty, there exists an epistemically priviledged domain where truths are available in all their self-evidence, and that even to a mind as innocent as that of an inexperienced young student. In the essay on *De Certitudine*, it is claimed that whatever such certainty can be found in the theorems of geometry, arithmetic, astronomy and the mixed sciences, it is due to the fact that quantity is the "most sensible" of all the accidents. But this distinctiveness of quantity as the indefinite expanse of the concrete world is related to the fact that it is not the *actus* itself or any *actio* or *potentia* of any substantial nature, just like everything is expected to be in a nature said *sicut simum*. In other words, quantity does not inhere in a *substratum* any more limited than prime matter, as all natural accidents do when approached as actions emanating from their proper *substrata*. Provided that to such a nature said *sicut simum* conforms a model of *scientia* that is meant to track strictly causal events in that nature, this leads to the inevitable conclusion that the lack of any limitations in its *substratum* makes pure quantity as perfectly transparent and manipulable as it makes it irrelevant to natural philosophy.

In the past, the degree to which the world of natural phenomena could be sufficiently spelled out in the language of mathematics was ultimately related to the manner and the degree quantity was built into the world or predated it in the story of its creation. So the more integral quantity was supposed to be in the order of creation, the more world-directed were perceived the quantitative disciplines to be. The placement of mathematics in the division of the sciences was

renegotiated as many times over as there appeared different contesting theories about quantity from Late Antiquity to High Middle Ages and from the Renaissance to the Early Modern era.

So, for example, one of the early champions of experimental reason and an important figure in the development of the Franciscan synthesis, Robert Grosseteste, held that light [*lux*] was the first form of the body in the order of subsequent perfections attained by any given substance. So extension or continuous quantity is neither some brute feature of matter, nor is it identical to matter. Instead, extendedness is said to be enacted in matter through the infinite multiplication of the substantial form of light. Given the diffusion of that lux into the natural world, many natural accidents found in it are supposed to observe the same geometric principles that govern the propagation and reflection of light. In such a model, the capacity for physical truths to be subalterned to mathematical truths (like optics or harmonics to a theory of proportion and not like medicine to geometry)/ is justified cosmogenetically by the priority given to the form of *lux* in the generation of the world. Whatever laws govern the quantitative make-up of the substance of the material world are consequent on a more fundamental substantial form acting as an exemplar.

So within this narrow frame of mind, any claims about the scientific value of mathematics would need to be backed up by a metaphysic that would relate quantity to some form of active principle, just like all natural effects are. To make mathematics natural and substantial it seems would require the world be created anew by a geometrizing agent, like the dēmiurge of the *Timæus*, or the God of Kepler, or the *lux* of Grosseteste. Inversely to make natural philosophy certain would require a different sort of cognition that could make self-evidence possible even in material affairs. Ultimately, a new validation of mathematics would likely need to be supported by an alternative metaphysics, a new epistemology of quantity or both.

Similarly Kepler (1604) puts his wild cosmological imagination to work when supposing the quantity was born first and extending into a sphere in the image of the Holy Trinity. Or when in early 1600s he elevates the status of arithmetic by elevating the origins of number to divine procession. In an unpublished manuscript of a diatyposis prepared as an introduction to Dasypodius's mathematical textbook and whose earliest mention is a 1629 letter to Matthias Bernegger, Kepler reads into Aristotle that: "something that produces certainty for all sciences derives from quantity, and then is accommodated to the other genera of things;" "… the very nature of human understanding itself, which seems to be such, by the law of creation, that it cannot know anything perfectly but quantities or by means of quantities."[268]

Likewise Piccolomini and the like-minded lot of Italian natural philosophers couched their negative assessment of the scientific value of mathematics on a host of theories about the nature of quantity, natural action, and of scientific explanation, theories that were gleaned from a long tradition of Aristotelian commentary that goes at least as far back as Averroës (1126-98) and Thomas Aquinas (1225–74). Having taken this difference in transparency as a matter of fact surrounding the human condition and its forms of knowing, like other philosophers before and after him, he meant to ground these limitations in a theory of metaphysics and psychology.

In that tradition, quantity fell under the category of accidental predicates and together with the other common sensibles [*sensibilia communes*] number, motion, time, and figure, were relevant to *scientia* only to the degree they reveal the activity of some metaphysical points of being. We rely on hard-earned and wisdom-inducing experience to associate the bee, for example, with a specific number of legs and wings, their particular disposition in a specific figure, degrees

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[268] Giovanna Cifoletti, "Kepler's De quantitatibus." *Annals of. Science* 43, issue 1 (July 1986), Ch. 1, pp. 223-4.

of freedom it has for moving and acting, not to mention other more complicated ethological features that form part of its identity. All that is geometrically-expressible in such natural beings are marks or symptoms [*signa*] of some underlying substantial nature by which we may infer its existence *ab signo* in the same way we attribute the pathology of an ill-disposed body to some agent whose true nature, just as the nature of the bee, is beyond our reckoning.

Prior to the introduction of any acts of being, according to the Averroist tradition in physics, dimensified matter is neither determinate, nor self-subsisting [*in materià prima quantitas interminata*]: (1) it is not subsistent because the category of measurable quantity, discrete or continuous, was declared unquestionably accidental. And if we suppose with Avicenna that corporeality was a substantial as opposed to an accidental form matter would not be able to receive any other form, according to Averroës.[269] Prior to the introduction of the forms, matter is also (2) indeterminate because, since all things on the side of actuality come from the form, an actual limitation too, or termination of quantity as they called it, presupposes the presence a substantial form. But if all natural beings act as they subsist, as formulated by Aquinas and adopted by Piccolomini, tracing these effects back to their source of emanation takes a natural philosopher inevitably to the interior of the *ousia*, which is naturally inaccessible to human perception.

But if, prior to the introduction of forms in the physical world, (i) quantity is coeternal

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[269] *"... quod si ita esset, tunc materia nullam reciperet formam praeter istam sibi propriam"* (Averroës, S*ermo de Substantia Orbis, Aristotelis Opera cum Averrois Commentariis …* [Venice: Iuncta 1552]) IX: cap. 1, fol. 3r a65 - 4r a56); Commentators had argued the natural beings would be units 'said like the snub' merely *per accidens*, either (a) in the manner Socrates is in temporary unison with his whiteness or (b) the manner Socrates is in proximity with Alcebiades. Given the Peripatetic axiom that unity is interchangeable with being, to say that two substances form the actual parts of a substance that encompasses both, according to option (b) is basically to say Socrates and Alcebiades so not subsist in their own, or that their groupings do not do so. Now though option (a) appeals to the intrinsic relation between substance and its attribute it would make finite bodies be distinguished from one another on the basis of their accidental features, in the manner one body of air is defined against another based on different values in a set of parameters taken on by the underlying substance, essentially ushering us toward the direction opened by Spinoza's monistic metaphysics, or prefigured by Wycliff in the middle ages.

with the most fundamental *substratum* of the world, while (ii) that *substratum* is as fundamental as it is also featureless, the spreadout-ness or extendedness of the world cannot be the natural product of some substantial form [*non habita formæ ratione*], nor can it be the principle of acting itself for any shapes, limits and volumes they appear in it [*Quantitas igitur non potest esse ratio agendi*]. And, if (iii) an attribute is more abstractible [*abstractionis facilitas*] by the degree its *substratum* is more limited, then (iv) whatever affections obtain within an absolutely unlimited *substratum* would be most fitting to be studied in isolation from their material conditions of subsistence. And to the degree that (v) the more abstractible something is, the more easy it is to know, certain and manifest [*faciles cognitu, certae, ac manifestae*, 108v] it must follow that: (vi) "… on account of the accident of quantity not inhering in anything more limited than pure *prima materia*, the extendedness of the world has nothing arcane and explains and manifests itself to us entire [*nihil habet arcani, seque totam nobis explicat & manifestat* (*Comm. De Cert*. fol. 108v)]."[270] And so far as geometric beings exist exactly as they are postulated and insofar as thinking about them lacks matter, they become identical with the thinking agent [*se ipsas penitus, & medullitus sensui nostro praebent* (108r?)].[271] Not being tied to any determinate subject they are in the faculty of imagination exactly as they are in the world [*materia autem intelligibilis, quantitas ipsa est, in phantasia collocata*]. On the other hand, insofar as as motion is studied *kath' hypokeimenou* or *sicut simitas*: "in a celestial body, or an animal or any other limited matter then, since it arises and flows from the proper principles it renders knowledge arduous

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[270] "Since quantity, as is commonly sensible, is assigned to no limited matter, for that matter it has nothing arcane and explains and manifests itself to us entire [*Quantitas igitur, quia sensibile commune est, nullique materiæ limitatæ addicit: iccirco nihil habet arcani, seque totam nobis explicat & manifestat* (*Comm. De Cert*. fol. 108v)]."

[271] "Mathematical affairs on the other hand, since they derive from abstraction, reveal themselves to the sense as they really are in their core, and make clear all things, since they are all quantities [*Res autem mathematicae, cum ex abstractione sint, se ipsas penitus, & medullitus sensui nostro praebent, seque totas patefaciunt* (108r?)."

and difficult [*si autem quatenus vel est motus in corpore coelesti, vel in animali, vel alio quouis modo limitato: tunc cum oriatur & fluat ex principiis propriis, & materiam sibi propriam limitet, cognitionem reddet arduam & difficilem*]."Just like all natural accidents said *sicut simum*, quantitative determinations too can be relevant to a demonstrative science only to the degree they are the signs for some non-dimensional (and for that matter also suprasensible) substantial activity. Indeed, the limits by which bodies appear to our *sensus communis* are according to the view of chapter III derivative upon the substantial forms they are organized by or "enacted by," one may say. But if all sensible determinations in the natural world is the product of active principles, any determinate number, volume and location in space, would be scientifically meaningful only to the degree it related to the nature of a specific element (water, air etc)—as the internal, the external and natural place of an elemental body or a mixture; while the study of figure, disposition and motion patterns of more complicated beings would be meaningful for science only to the degree they were able to come together into uniquely-identifying differences for classifying their natures.

On the other hand, phenomena said *sicut concauus*, like the eclipse, bearing as they do no attachment to a particular kind of subject, may as well manifest in the moon or the earth or any celestial body. On an even higher level of abstraction the beatific motions of a celestial body can be analogically related to the mechanical motion of a wooden ball in an armillary sphere. Finally, when completely removed from any sensible, non-geometric properties they can be studied merely as bodies in simple motion; in that way they can exist in the world exactly as they exist in geometric imagination. Insofar as quantity is thus studied *ēi mē kath' hypokeimenou*, or *sicut curvitas*, it inheres in *materia prima* of the concrete world in the same manner it inheres in the

imagination of the geometer as the *materia intelligibilis* for all their relevant constructions. Going back to the reason given as to why humans can only argue about nature *a signo*, i.e. symptomatologically from effects to causes, the capacity for mathematics to submit, according to Averroës, both the 'fact' and the 'reason why' under the selfsame intuition must relate to the fact the geometrician is actively engaged in the construction of her subjects, something that no human, at least none after Adam perhaps, has ever been privy to in the realm of nature. So if indeed something is eminently demonstrable from the point of view of the artificer, such a level of cognition would be reserved to an agent that actively partakes in the construction of natural beings in the manner a geometer actively engages in his constructions- artificer's point of view.

III.9 From Quantity to Thing

Descartes arguably goes to great rhetorical lengths to ease into the consciousness of his reader a world that contains in itself "absolutely nothing that anyone cannot know as perfectly as possible." The rhetorical device of the *similitudo veri* of a world perfectly knowable shows that Descartes's world could only be presented as *scientific fiction*, and the whole doubting process would reawake the *Gnostic fiction* of an all-powerful and deceiving *genius malignus*.

If the hypothesis of a colorless, odorless, tasteless, and soundless material world does not strike us as strange, it speaks to the rationalist grounds of our modern sensibility. But these once-new attitudes emerged in stark contrast with the pessimism and skepticism that was native to what had become of Aristotelian natural philosophy in the Renaissance.[272] Unless we revisit such mentalities be revisited and recreated, the impact and meaning of these new epistemic attitudes, not to mention the rhetorical devices they are conveyed by, might be invisible to our modern worldview. For the world was thought to contain constitutively obscure elements like formal principles and occult principles that were simply as inaccessible to human sense as they were inscrutable to human reason. Arguably for the kind of education received in a Jesuit institution and the educated audience that Descartes meant to address, a world that "only contained what can be perfectly perceived by the human intellect" would have even *less claim to reality*. This is why Descartes goes to such great rhetorical lengths to bring his world to an equal footing with the existing one in terms of conceivability at least.

We saw that a celestial phenomenon, just like a geometrical theorem, may admit multiple

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[272] An anthology of passages that declare the weakness of human knowledge can be found *Philosophy of Sir William Hamilton* (New York: D. Appleton & Co., 1859), 517-530.

explanations none of which need be postulated as a *similitudo veri*. For truth in the natural sciences entails the causal understanding of scientific demonstration of APo, and no one has ever been privy to any substantial nature lying behind appearances and which would settle ultimately the one and only true hypothesis from which all emanations proceed as a matter of fact. In introducing a new world containing "nothing that cannot be evidently known" as *scientific fiction*, Descartes effectively hijacks the license of the astronomer to argue about the system of the world in existentially neutral terms.

Descartes begins by relying on the mathematician's license to suppose existentially neutral terms for the purposes of computational facility before. But then, in the context of the metaphysical questions about the immortality of the soul, just as he argues about the subsistence of the pure subject of thinking, he also argues about the subsistence of an equally crystalline world as the underlying physical reality of all experience, through a conception of a divine will that encourages belief to a superlatively intelligible world. In short, in Descartes's writings we witness a transformation of the role of quantity in his thought from a heuristic tool and an encoding device [*quædam de quantitate supponere*], to the nature of a hypothesized world [*natura corporæ*] and from there to being hypostasized as the world [*res extensa* or *res materiales*]. The whole course of rendering quantity from its scholastic status as an accident to something substantial by Descartes is as fascinating as it is complicated.

It began in the early *Regula* XII (c. 1626-28) as an innocuous suggestion to symbolize sensible differences by so many differences in two-dimensional shapes. Just like the geometer makes certain assumptions about quantity, with no less demonstrative power, howsoever differ-

ently a physicist studies the nature of quantity [OR matter] as enmattered,[273] this would be a serviceable heuristic tool that would allow one to ingeniously read into reality an *order*, even if that order is not actually present in it (AT X 394). Following purely methodological considerations and with no metaphysical purport, Descartes suggests the transcription of the … to the … so that they be resolvable to relations of *identity* may be read and … make a sound basis for enumeration of the *experimenta* … and spell out the terms that an ennumeration could be conducted so that the relations of order and identity become …

It later re-appeared in the first pages of the *Dioptrique* (1637) under the pretense of convenience for deducing unobservable properties from the observable in the manner astronomers deduce conclusions most true and assured [*tres vrayes et tres assurées*] from assumptions false and uncertain [*fausses ou incertaines*].[274]

For the most ambitious project he ever undertook, but never published, the *Le Monde* (w. 1619-1633), Descartes introduced geometric magnitude as an intrinsic feature of a new world hypothesized. Moving beyond the purely methodological approach of the *Regulæ*, he is aware the world he is proposing has no more claim to reality than the one that came before it. Arguably, for the educated audience he meant to address, a world containing that "only contained what can be perfectly perceived by the human intellect" would have even *less claim to reality*. At this point Descartes's approach amounts to no more than an equal claim of a colorless, odorless, soundless and tasteless world to actuality.

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[273] "Non ſecus quàm in Geometriâ quædam de quantitate ſupponitis, quibus nullâ ratione demonſtrationum vis infirmatur, quamvis sæpe aliter in Phyſicâ de ejus naturâ ſentiatis (AT X 412, ll. 10-13)."

[274] "[I]mitant en cecy les Aſtronómes, qui, bien que leurs ſuppoſitions ſoyent preſque toutes fauſſes ou incertaines, toutefois à cauſe qu'elles ſe rapportent à diuerſes obſeruations qu'ils ont faites, ne laiſſent pas d'en tirer pluſieurs conſequences tres vrayes & tres aſſurées]" (AT VII 83).

The reference to familiar cases of *semiosis* is clearly meant to mitigate the strangeness of that parallel world. Signs are found related to meanings by human convention—in the way meanings are invoked by a word or a sound that is of a completely different order—or by a fiat of nature—in the way that a particular expression of the face is a sign of the inner state of happiness. And just as an Arts student of the time might have internalized the meaning of a lecture without any definitive recollection of the language it was originally delivered in, we may as well wonder at least, whether our experience of the world suggests a particular system of natural signs or not. If sensations of pain or sound bear no resemblance to their proximate causes, what precludes us from conceiving all sensible reality in that manner? Such illustrations—reminiscent as they are of Galileo's epoch-making *Il Saggiatore* (1623)—are meant to show the reader this strange world is at least partly instantiated in a portion of our sensible reality. In the same decade in which Galileo was extrapolating the way our pains and ticklings relate to the world beyond our minds to the sensation of heat, Descartes did the same for the sensation of light and whatever objects it was supposed to convey. If the colorful, odorous, sonorous, tasteful world of Aristotle, whose objects are formally continuous with the ideas produced in our senses, is just one among many in the vast store of possible worlds, could not a world be imagined such that it contains, *prout in se est*, "absolutely nothing that anyone cannot know as perfectly as possible?" So what was introduced as a convenient encoding device is now asserted as a possible world, i.e. merely as a non-contradictory scenario that could have been if God willed it. In *Le Monde* we read:

> [M]y plan is not to set out (as they <the philosophers> do) the things that are in fact in the true world, but only to make up as I please from [this matter] a [world] in which there is nothing that the densest minds are not capable of conceiving, and which nevertheless could be created exactly the way I have made it up. … [B]eing able to imagine distinctly everything I am positing there, it is certain that, even if there be no such thing in the old

> world, God can nevertheless create it in a new one; for it is certain that He can create everything we can imagine.[275]

In retrospect he admits about the same era in the *Discours*:

> … I did not want to bring these matters too much into the open, for I wished to be free to say what I thought about them without having either to follow or to refute the accepted opinions of the learned. So I decided to leave our world wholly for them to argue about, and to speak solely of what would happen in a new world … I described this matter, trying to represent it so that there is absolutely nothing, I think, which is clearer and more intelligible, with the exception of what has just been said about God and the soul. In fact I expressly supposed that this matter lacked all those forms or qualities about which they dispute in the Schools, and in general that it had only those features the knowledge of which was so natural to our souls that we could not even pretend not to know them.[276]

In a different part of the *Discours*: "… it may be believed, without discredit to the miracle of creation, that, in this way alone, things purely material might, in course of time, have become such as we observe them at present; and their nature is much more easily conceived when they are beheld coming in this manner gradually into existence, than when they are only considered as produced at once in a finished and perfect state." (*Discours*) This is very much in tune with the tradition set up by the *similitudo veri* of *Timæus*: just like in *Timæus* Descartes does not necessarily describe a factual genesis but a way to teach by presenting the eternal structure of the universe as a matter of developmental stages distinct in time, in the same way the geometers of the Academy would go through a sequence of constructions to discover a property synthetically, among other things provable.

The *L'Homme* too, that was supposed to be annexed to the *Le Monde*, puts forward a theory of mechanical physiology in response to a self-imposed challenge to a clock-making or fountain-building skills to construct an automaton whose coordinated behavior is indistinguishable

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[275] René Descartes, *The World and Other Writings*, edited by Stephen Gaukroger (Cambridge texts in the history of philosophy. Cambridge, U.K.: Cambridge University Press, 1998), Ch. VI, p. 24.

[276] CSM I: 132, AT VI 42.

from such behavior that is normally ascribed to a vegetative soul. So it is presented in the form of a *simulacrum* that is created by God to resemble the human being as much as possible [almost like a divine puppeteering], insofar as its functions proceed from matter, the laws of motion and the disposition of the organs.

> I suppose the body to be nothing but a statue or machine made of earth, which God forms with the explicit intention of making it as much as possible like us. Thus God not only gives it externally the colours and shapes of all the parts of our bodies, but also places inside it all the parts required to make it walk, eat, breathe, and indeed to imitate all those of our functions which can be imagined to proceed from matter and to depend solely on the disposition of our organs.[277]

Just as in the *Le Monde*: "the greater part of the matter of this chaos had to become disposed and arranged in a certain way, which made it resemble our heavens" so too in the *L'Homme*, which would have formed part of the same work, the same matter was made by God to resemble our bodies, "both in the outward shape of its limbs and in the internal arrangement of its organs" (AT VI: 43, 46) so there would be left no way of telling the difference between such automata did not possess the same nature as animals.

So far then Descartes's cosmology can only claim the status of a 'likely story' [*eikōs logos*] among a vast store of possible scientific 'stories' that have an equal claim to possibility, but unequal claim to intelligibility. Using the oft-cited among early moderns illustration of the clock: confronted by the surface of our phenomenal reality that, just like a clock-face, does not reveal the principles of its operation, one may offer equally plausible explanations about the coordinat-

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[277] "Je ſuppoſe que le Corps n'eſt autre chose qu'vne ſtatuë ou machine de Terre, que Dieu forme tout exprés, pour la rendre la plus semblable à nouse qu'il est poſſible: En sorte que non seulement il luy donne au dehors la couleur & la figure de tous nos membres, mais auſſi qu'il met au dedans toutes les pieces qui sont requiſes pour faire qu'elle marche, qu'elle mange, qu'elle reſpire, & enfin qu'elle imite toutes celles de nos fonctions qui peuuent eſtre imaginées proceder de la matiere, & ne dependre que de la diſpoſition des organes" (CSM I: 99, AT XI: 120). Also in: René Descartes, *L'Homme de René Descartes et un Traité de la Formation du Foetus*, ed. Claude Clerselier [Paris: Theodore Girard, 1664], pp.1-2).

ed movements of its hands. The clock might be influenced into this rhythmic motion by the co-ordinated motions of the celestial bodies, in the same occult way a compass is influenced by the north pole, or the seas are influenced by the motions of the moon; as likely as the same clock-face may indicate so many signs of animal behavior brought about by a vegetative soul just like the story Boyle reports of some "civiliz'd Chineſes" taking a watch for a living creature.[278] Though equally conceivable—and by virtue of God's infinite power and absolute will, equally possible principles of operation—these possible explanations differ as they are more or less clear to human understanding. Any model of codification can be just as true as the next, in the same way the Latin sign for curvature [*simitas*] is no more true in regards to its meaning than the Greek equivalent [*simon*].

His whole discourse prior to the *Meditationes* relies on the poetic license of the astronomer to fictionalize different hypothesis aring not about their reality but how they lend themselves to evident and economical demonstrations. So essentially Descartes imports the criterion of certainty in abstract sciences as a criterion of truth in the concrete ones. It is a fiction of a parallel world where the more evident is the more real... and the attenuated object of geometry becomes concrete.

But here in the *Meditationes* (1641) and the *Principia* (1644) later, it asserts itself with the force of a metaphysical truth, such that the subject matter of physics would be identical with the subject matter of pure mathematics. In short, Descartes argues for the subsistence of the matter-independent object of mathematics.

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[278] Robert Boyle wrote that: "A Country Fellow here in *England* knows ſomething of a Watch, becauſe he is able to tell you, that 'tis an Instrument that an Artificer made to Measure Time by: and That is more than every *American* Savage would be able to tell you; and more than thoſe Civiliz'd *Chineſes* knew, that took the firſt Watch the Jeſuit brought thither, for a Living Creature" (*A Disquisition about the Final Causes of Natural Things* (London: H. C., 1688) Proposition V, p. 230.

So, over the course of his writings Descartes takes the category of quantity and turns it into an attribute, a quasi-nature. It begins as a convenient encoding device in the course of the *Regulæ*; constitute the stuff of the world in a "likely story" for the coming-to-be of the world, until we reach the meditations, where quantity changes its traditional categorical status is allotted, as an attribute, a manner of self-subsistence completely separate from the attribute of thinking. Instead of the possibility of a world that "contains nothing that..." there is here a metaphysical reasoning about the self and God, thought and matter that is meant to prove why indeed this is the actual world we inhabit as opposed to the naturally unintelligible sources of being in premodern discourse.

III.10 Conclusion

We saw that the pre-modern and modern conceptions of matter were held apart by vastly *different theological values and epistemic priorities* of the systems of thought they formed parts of.

Just as Thomas's and Descartes's thought express very different epistemic values, the way they frame the world and the position of the human being bear distinct, irreconcilable even, motivations. As suggested earlier, Thomas is *committed by a theologian's agathic worldview to find a place for the soul and of embodied forms of knowledge within the order of the universe whose goodness, as its perfection, extends from prime matter to God. In contrast, Descartes's vision in the* Meditationes *is motivated by the extant epistemic need to make the immortality of the soul provable by natural reason*.

The premodern body was an inalienable part of the human *persona* and a condition for its subsistence, by the relative degree of materiality it bestowed on it, it gave it its unique niche in the *ordo rerum*. But just as the presence of matter made possible a *continuum* of beings along the scale of perfection, by the axiom *receptum est in recipiente secundum modum recipientis* (76.A1, ob 3), the concentration of matter in each being afforded an equally continuous scale of knowing power. So, in a world where being [*esse* or *perfectio*], the knower [*vis cognitiva*] and the known [*objectum proprium*] scaled up gradually from the absolute destitution of *prima materia* up to the absolute fullness of God, the dignity of the human being was tied to its uniquely human form of knowledge and that to the dignity of the proper object of that knowledge. So the subsistence of a world of sensible particulars *extra animam* that gave human cognition its proper object, also gave the human being, by that transitivity between the known and the knower, its unique place in

the fabric of creation. The existence of that world was affirmed here with the force of a postulate, and whose negation would lead directly to the theologically unattainable conclusion that the soul's embodiment was against its nature, and thus also obstructive to an otherwise higher level of knowing.

So the natural realist took the subsistence of matter for granted—in the form of all that furniture of the world that lies behind the sensible phenomena—and would then theorize, as much as Aristotle's letter would allow it (or that of Peter the Lombard, for that matter), what in that world could be humanly known by its unique ability to alembicate impressions to thoughts by a process of iterative abstraction from matter: corporeal senses abstracting sensible forms from matter; imagination and memory storing the afterimages of such composite impressions; finally, the intellect distilling those afterimages to intelligible forms and manipulating them by composition and division into *quidditates* in the light of a systematic study of a particular subject matter [*subiectum genus*].

By contrast, the early modern thinker, Descartes in particular, was made certain about the reality of their own thought-world, as much as he was about the validity of certain fundamental judgments formed within, and only then would he attempt to relate these inner givens of the *lumen naturale* to the world. Working in reverse from his predecessors that allowed the purported causal structure of the world dictate what is more true, Descartes will wonder, quite contestably, what kind of world we would get if we set certainty as the sole criterion of truth. So where the Thomist takes the world for granted, the Cartesian takes first-personal thinking for granted and explores whether there can be found any sufficient reasons within so as to argue deductively for the subsistence of matter beyond the self. Effectively, *the existence of matter that was admitted*

as an indemonstrable postulate in premodern times, would stand now as a demonstrable theorem. Overall, the weight of priority has clearly shifted from an order of concepts that considers the subsistence of the world indemonstrable and the immortality of the soul partly an object of belief, to one that raises the subsistence of self into principle and makes the subsistence of a perfectly intelligible world the object of rational belief.

This strategy negates many principles that made Pomponazzi claim the matter 'neutral.' But it is a startling hypothesis at that, because: (1) the proper object of human souls was supposed to be a naturally existing quiddity in matter, (2) and the human soul in this life was supposed to be invisible both to the fellow human being and to its own itself. To the other because it would know it from effects (signs and language); to the soul itself because the soul did not consist completely in its intelligible part. But there is a price for rendering the soul naturally self-subsistent: While in Aquinas view the soul is naturally embodied in *vita præsentia* and only supernaturally disembodied in *altera*, in the manner a portion of water is lifted up away from its natural place; in Descartes's view the soul, though naturally self-subsistent, it now requires divine concurrence for its embodiment, much like a portion of air, can be forcibly contained in a bubble in the water.

Yes, all which it inherit, ſhal' diſſolve,
And like this inſubstantiall Pageant faded
Leaue not a racke behinde: we are ſuch ſtuffe
As dreames are made on; and our little life
Is rounded with a ſleepe[279]

The previous chapter, on *Matter and Self*, indicated how the Cartesian doctrine of ideas posits *ideas* as the immediate object of the mind, whereas the pre-moderns posited matter-bound natures or quiddities. In Descartes's new understanding of the mind and its subsistence, the reflective operation over its own acts does not rely on the world, as it did before. Consequently, the existence of a world at large is just another item that may turn out to be false. Ultimately, the reader is asked to relinquish a mindset that took the existence of the external world as intuitively evident, but left the immortality of the soul be settled by revelation, and enter another where the self can identify itself with its incorporeal cogitative part but which leaves the existence of anything outside of it uncertain or inconclusive. Effectively then, the existence of matter that was admitted as an indemonstrable postulate or an intuitive truth in premodern times, would stand now as a demonstrable theorem in the modern.

In George Berkeley's (1685-1753) view, the doctrine of ideas that emerged in the writings of Descartes marked *the ground zero for a specific vector in the history of ideas that had led to the kind of absolute idealism he was advancing convergently with Arthur Collier.* He believed that when Descartes challenged the consistency of, say, a mind-independent hotness, or the formal truth of statements like 'the fire is hot,' he set off a process, that would not be completed until all ideas had been purged of their material counterpart in the real world. Berkeley chose to historisize this 'vanishing of matter' as the coming of age of philosophy out of its prolonged Peripatetic adolescence. He will suggest *desubstantiating* all qualities, in confidence that the immaterialist philosopher merely extends against the corpuscularian the same kind of critique the latter had already directed against the scholastic.

Berkeley went as far as sketching out a theory of the psychogenesis of the notion of matter. On a first level, he thought it had been motivated by the intellectual need to suppose a *substratum* for the subsistence of qualities beyond the self, which was for him natural as also relevant to his day. If our self is equally resisted by objects while dreaming as much as it is resisted by objects in its waking life,[280] the mere fact that objects presents themselves despite or against

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[279] William Shakespeare's *The Tempest*, Act 4, scene 1, 148–158, first published as part of the *First Folio*: *Mr. William Shakespeare's Comedies, Histories, & Tragedies* (London: Isaac Iaggard, and Ed. Blount, 1623), p. 15.

[280] In regards to associating resistance with existence, Malebranche wrote: "You believe this floor exists because you feel it resist you. … But do you think your ideas do not resist you? Find me then two unequal diameters in a circle, or three equal ones in an ellipse. Find me the square root of eight and the cube root of nine. … [M]ake two feet of intelligible extension equal no more than one. Certainly the nature of this extension cannot countenance that. It resists your mind. Do not, therefore, doubt its reality" [*Dialogues on Metaphysics*, trans. Willis Doney (New York: Abaris, Books, 1980), *Dialogue* 1, pp. 34-35].

its will does not entail their extramental origins. Clearly, *there must be something differentiating waking life from dreaming, and it is natural to suppose that that something is of a different stuff than* "dreams are made on." So, in our attempt to absolve ourselves from the authorship of certain ideas that are inadvertently excited in us—an attitude that is, in and of itself, as natural as it is valid—we sought for ontological and causal support in matter, driven by the false presupposition that, *if an object of thought is independent from my will or yours, it must also be independent of all thought whatsoever*; a "stupid, thoughtless *Somewhat*."

However, the more one solemnly reflects on the objects of our immediate awareness, the more we would recognize in them the brand of mental activity, and by that degree the less we would need to impute them to some mind-independent reality; so much so in fact that, in a certain way, the difference between painless impression made by the mere sight of the weapon (its *species*) and the painful impression inflicted to the flesh becomes a matter of degree, not of nature. Reality differs from an illusion—or any case of non-veridical perception for that matter—in the way a lucid and internally coherent dream differs from a confused one (*Dialogues* III, 108; *PHK* §34). The difference between the real or substantial and the ideal or phantastical becomes a matter of degree of intensity and coherence of sequence. Ultimately, the epistemic quest for what had hitherto been framed as the hidden essence of things behind these qualities should reorient itself towards the understanding how these qualities are ordered and conjoined in the divinely instituted language of lived experience.

IV.1 Descartes's Argument for the Existence of External things

After Descartes, what everyone came to call matter became synonymous with the 'external world' or, the 'world without' in the English-speaking world—i.e. the world as it is in and of itself and irrespectively of any act of thought, be it human or divine. Even if not exactly or not always matching how it appears to our external sense, we, just as Descartes's meditator, cannot help but expect something to subsist on the other end of our acts of thought lest our lives merely be "ſuch ſtuffe as the dreames are made on," in the words of Prospero.[281] Demarcated as the world without or external to thought, Descartes's matter would be the penultimate target of the global dream argument in the first *meditatio* of Descartes, as it would also be the last thing to be reconstituted in the sixth. In that sense, it is a world supposed to exist beyond the horizon of thought lest we be obliged to admit that we might as well have always dwelled in, and never awakened from, a collective dream.

Following the contraction of the self into a subject of conscious thought in *meditatio secunda*, the next move considers which out of all candidate cognitive objects—mental or corporeal—, can be found to subsist beyond the periphery of the *Ego*: on a first level, the meditator stumbles upon the profuse reality entailed by a very special native idea, that of God. Our lack in resources to put together such an elaborate 'engine of' a notion, that of an absolutely perfect, omnipotent, omniscient, and actually infinite being,[282] indicates its non-human and non-finite origins. By analogy, it would be very unlikely (if not impossible) for a plan of a complicated

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[281] William Shakespeare's *The Tempest*, Act 4, scene 1, 148–158, first published as part of the *First Folio*: *Mr. William Shakespeare's Comedies, Histories, & Tragedies* (London: Isaac Iaggard, and Ed. Blount, 1623), p. 15.

[282] *aeternum, infinitum, omniscium, omnipotentem, rerumque omnium, quæ praeter ipsum sunt, creatorem intelligo* (AT VII 40); *idea entis perfectissimi* (AT VII 51); *idea entis summe perfecti & infiniti* (AT VII 46) *ens summe perfectum* (AT VII 66) et alibi.

functional engine to have been jumbled together by a series of subconscious operations even if I had partial intuitive access over its constituent parts. But what about all other objects populating our mental and material worlds?

After *meditatio tertia*, Descartes's meditator aims to recover some form of non-mental existence to intervene between the self and God. What about the stuff of thought that both dreams and waking life are made on, to wit, the *spectra* of colors, sounds, smells, tastes, texture and the continuum of space generally considered [*magis simplicia et universalia*; *simplicissima et generalissima* (AT VII 20)]? For all he knows, contrary to the idea of God, the existence of all other finite thinking substances and their modes, as well as all other corporeal substances and their modes, might as well have been suggested internally through some unseen cognitive mechanisms (AT VII 39), even if they assert themselves despite or against my will. In the same unconscious way these objects the ideas of substance, duration, number, thought or extension etc. are compounded into dreams or chimeras, they could as well be fused into an external world without our assent.

But there is an epistemic covenant between God and thinker: if man did his part and restricted his assent solely to what is clearly and distinctly presented to the intellect, such ideas would at the very least have to be materially true [AT VII 62], i.e. real and positive objects of thought in themselves. For if they are not produced out of confusion or falsely reified by human thought in all its weakness, they must be part of the order of creation, and as such they should necessarily be *something*, even if that is restricted to their formal being as modes of our own thinking [*omnis clara & distincta perceptio proculdubio est aliquid, ac proinde a nihilo esse non potest, sed necessariò Deum authorem habet,* (AT VII 62)]. On the other hand, the immediate

objects of sensation, for one, despite their vividness, are not distinct enough to be told apart from other creations of the mind. Insofar as this mind participates in nothingness in all those things its nature falls short of, vacuous things can spontaneously arise out of *nothing*. For all we know, feelings of cold and hot, hungry or full, might as well be "materially false," i.e. they might be false reifications of the non-objectifiable things into objects of thought like the idea of a square circle, or the idea of nothingness.

Not so in mathematics, which, leaving us no doubts about the cognitive reality of its subject matter, allows us to vouch at the very least for the material truth of its objects. There are true and immutable natures within, like triangles and circles, which can be intellectually discovered and unprecedented properties be proved of them independently of the geometer's will or any existential considerations.[283] For, though they can be invoked *ad arbitrium*, the properties that follow from them pertain to them independently from my will [*velim nolim clare nunc agnosco*], and my coming to know them [*etiamsi de iis nullo modo antea cogitaverim* (AT VII 64-65)], and most importantly, independently of whether they subsist in the world or not [*utrum eæ sint in rerum natura necne, parum curant* (AT VII 20)].

At this point, prior to *meditatio* VI, Descartes finds in clarity and distinctness, i.e. the evidential value of things thought and properties demonstrated, a standard of truth that is not dependent on an external world even if not dependent on the will. For all intents and purposes, Descartes here acknowledges the matter-independent subject matter of mathematics, exactly as discussed in chapter III. Even if the simple natures found *apud me* may be contained eminently

[283] "… utrum eæ sint in rerum naturâ necne, parum curant" (AT VII 20)]; "… etiam si extra me fortasse nullibi existant (AT VII 64);" also *Discours* IV:"ie pris garde auſſy qu'il n'y auoit rien du tout en elles qui jm'aſſura de l'exiſtence de leur obiet" (AT VI 36, ll 16-18).

in me, as in their author; even though they might be my own *fictum*, I can still draw valid and useful conclusions out of them αϭ astronomers do with their own hypotheses.

Still, however, an indefinitely extended substance lacks the objective reality discovered in the idea of God, whose overabundance would point to a more noble origin or more publicly available than the finite self. At this stage in the *Meditationes*, no truth inspected or generated within the *pura mathesis* relies on the subsistence of an external world, just as there is nothing in the notion of an external mindless world that would require these truths be exemplified by all bodies. Since these simple natures are understood as the real colors on which both to imaginary and real things are painted on [*ex quibus tanquam coloribus veris omnes istae, ... rerum imagines effinguntur* (AT VII 20)]—their restoration gets us as far back as the reality of that mind-dependent stuff that both dreams and waking lives are made on. Even though there is interpolated an order of liveliness, vividness and distinctness amongst the particular objects of sense perception from those put together in imagination or found in memory (AT VII 75), there are still no sufficient indices [*indicia*] to distinguish dream from reality. A dream is a dream even if the geometrical and arithmetical laws hold as true there as they do waking life.

The last step of the argument of *meditatio* VI relies on a *modus tollens* from the view that: if the ideas that the faculty of sense receives [*recipiere*] and knows about [*cognoscere*] were transmitted from a different source than corporeal things, or a *res extensa*, God would have to be understood as a deceiver. Even if the meditator occasionally dreams about sensible objects, Descartes claims the *facultas sentiendi passiva* which presupposes an intellectual act must have

been originally complemented by a *facultas activa* that is wholly other than thought.[284] Since the only other idea of *substantial nature* he has is of body, that *facultas activa* might as well be the faculty of being extended, of changing position, of rotating, dilating, etc. If the ideas of sense originate in a being that is anything other than what we conceive the body to be as clearly and distinctly as possible [*omnia, generaliter spectata, quæ in puræ Matheseos objecto comprehenduntur* (AT VII 80)] whether it be the mind of God directly, or some other substance, that would mean God is a deceiver.[285] If one pays due diligence in perceiving corporeal nature as clearly and distinctly as they possibly can, God is expected to have made such a world true, and not a *fictum*. With this the epistemic covenant between God and thinker is protracted in the domain of extramental existence.

With the model of the *cogito* argument as the first statement that is as certain as it is true, Descartes will go ahead rebuilding the material world by extrapolating this over all creation. Though Descartes had successfully brought the soul as mind into matter-independent subsistence, in *meditatio secunda*, by revealing the incorporeal act it subsists in, despite his better efforts in *meditatio sexta* for restoring the world into mind-independent subsistence, nothing beyond the *Ego* and *Deus* could ever be pulled out from the *maelstrom* of self-imposed hyperbolic doubt (at least not as convincingly). The self-evidence of the *Ego* (*meditatio* II) and the overabundant reality of the idea of God (*meditatio* III and IV) had already set a standard of certainty that could simply not be matched by the existence of the material things. For if the former makes

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[284] Presuming the validity of two common and immutable truths of metaphysics such as that: *for a faculty to be useful every passive faculty must be complemented by an active one* and that, *insofar as it is passive, the faculty of sensation presuppposes an intellectual act*.

[285] "… cum Deus non sit fallax, omnino manifestum est illum nec per se immediate istas ideas mihi immittere, nec etiam mediante aliqua creatura, in qua earum realitas objectiva, non formaliter, sed eminenter tantum contineatur (AT VII 79)."

[a] the immediate object of a non-negotiable rational intuition, and the latter is [b] inferred deductively from an idea contained within of such an intricacy than no finite mind could ever fashion alone, the nature of matter can do neither: its existence cannot be immediately intuited, like the *Ego*, nor can it be deduced as the external source of some token of objective reality that exceeds the reality of its bearer, like *Deus*. So far as the *Principia* criterion of substance applies to both *res*, *extensa* and *cogitans*—as a thing whose subsistence is not dependent on any other thing than God's concurrence—they are equally real in the leaner version of a scale of *realitas* Descartes adopts.

Chapter III hopefully showed how the boundaries between the self and the world that we explored in the previous two chapters were cast anew by Descartes on the basis of their degree of certainty. The boundaries between the self and the world were laid anew on the basis of the immaterial vantage point that only a *mathēsis pura* could offer. Descartes's meditator was set to externalize more features of the world according as they are found less infallible. However, when leaving it up to evidential value to decide where the world ends and the self begins, we would expect the boundary between self and world be related directly with what can possibly be cast to reasonable doubt. Since, for Descartes, the reflective operation of the mind in becoming aware of its own act does not rely on the world, the existence of a world at large is just another item that may turn out to be false.

The move towards external-world skepticism that would ensue within the Cartesians, had been enabled by Descartes's realization that to affirm the existence of anything beyond one's self is the work of judgment. For as we saw, all created things besides the perfect being, existence is not included in its essence. So existential judgments, judgments about whether something exists

or not, are not intuitively certain. We are somehow responsible for what we take to be existing. We are not passively disposed toward the existence of the world. From within the sphere of the mind, we can be no less certain that anything we see or touch exists than that the hats and cloaks of passing people outside Descartes's window conceal real people instead of automatons.

Ultimately then, Descartes takes the reader from a world where the existence of the world is indisputable, but the subsistence of the thinking is debatable, to one where the subsistence of the thinking self marks the first intuitive truth while the existence of the world is an open problem of demonstration. In other words, the reader is asked to relinquish a mindset that takes the existence of the external world as intuitively evident, but leaves the immortality of the soul be settled by revelation, and enter another where the self can identify itself with its immortal cogitative part but which leaves the existence of anything outside of it uncertain or inconclusive. Effectively then, the existence of matter that was admitted as an indemonstrable postulate in premodern times, would stand as a demonstrable theorem in the modern.

IV.2 Ground Zero for Dematerialization

Soon after the promulgation of the *Meditationes*, Pierre Sylvain Régis, one of the first followers and eventual nemesis of Descartes, thought that even though the world may as well be non-existing, this would not make us victims of a cosmic deception. For, even as a hypothesis, the existence of external bodies could serve all functions of practical life; just as the apparent motion of the sun should not have compelled our uncritical ascent, yet despite of this, people had still navigated themselves around it as a probable fact.

On a different front, in the *Traité de l'esprit de l'homme* (Paris, 1666) by Louis de la Forge (1632–1666), the causal bond that bounded one state of affairs to another in the material world, as well as that of between corporeal event to a mental event, had been weakened into an *occasion* for God's immediate activity. Working along the same self-avowed Cartesian lines, but having denied causal efficiency from both minds and bodies, Géraud de Cordemoy showed existence of the external world to be an article of faith, not reason. Drawing on the same global occasionalism in regards to minds and bodies, Nicolas Malebranche (1638-1715) considers matter not only inefficient but also unknowable in itself in the *Recherche de la vérité* (1674-5, 78).

With Malebranche, the material world ceased to be intelligible *per se*, and it now required, much more than the clear and distinct idea of *natura corporea* that is built in human minds, nothing less than a partaking in divine mentality. [*Nous voyons toutes choses en Dieu* (Livre III. cap. 6)]. By the time Malebranche responded to the skepticism of Simon Foucher (1644–1696)[286]—in his *Eclaircissement VI* appended to the 1678 edition—he admitted the exis-

[286] Simon Foucher expressed his scepticism about the external world in the *Critique de la recherche de la verité* (Paris: Coustelier, 1675) and later replied to by Benedictine Robert Desgabets, *The Critique de la critique de la Recherche de la vérité*, (Paris, Jean Du Purs, 1675).

tence of the material world cannot be demonstrated by natural revelation. Much less than its existence being demonstrable, he gave solid *a priori* reasons why it should not be so.

By 'vanishing of matter,' as Berkeley understood it, we may refer to that historical period of thought beginning with the first champions of corpuscularian physics in the early 17th century, in Italy (Galileo), England (Bacon) and Holland (Beeckman and Descartes), extending to the occasionalist vein of the Cartesian program in France (La Forge, de Cordemoy, Malebranche), Germany (Clauberg), Belgium (Geulincx); and the English variety of corpuscularianism of Hobbes, Boyle and Locke; ultimately to the first immaterialist hypothesis arrived at independently by two Anglican priests, one Irish (Berkeley) and the other English (Collier) in the early 1700s.

For matter to be 'vanishing' means that what originally subsisted as a colored, tactile, sonorous, saporific world was whittled down to so featureless a *substratum* that Berkeley and Collier were left with no other way of invoking it but by the same terms by which the much-maligned notion of *prima materia* used to be invoked in the past, i.e. a *nec quid*, *nec quale*, *nec quantum*.

A survey over the post-Cartesian period shows that, as that world was being divested of its qualitative make-up, it was *being absorbed into some mentality, human or divine; and it was also becoming the immediate object of the divine will, as it was being deprived of its causal efficiency*. At least according to a very young George Berkeley who took what remained of philosophical matter in his time as just another name for "nothingness" in a long list of privative terms aborted over the course of intellectual history, insofar as it suggested a habitual prejudice of the mind in gradual decline, now subject to historicization.

How could the external world, which by the end of the *Meditationes* was restored back into subsistence according to the prescribed order and rules for the mind, seemed to Berkeley to be relegated to so slight and empty a being? More crucially, how was such a gradual attrition of matter precipitated by philosophers who were self-avowedly working within the Cartesian program as it was taking hold of Europe, merely taking the doctrine of the clear and distinct ideas to its proper conclusions?

Early modern corpuscularianism of course was not intrinsically related to external-world-skepticism. But when Galileo described heat as the motion of agitated, insensible fiery particles in his *Il Saggiatore* (1623), or even earlier, when Francis Bacon described heat as a kinetic pattern of any parts of matter in the *Novum organum* (1620), they undermined sensible experience as an epistemically privileged domain.

The doctrine of ideas was introduced in the *Meditationes* as a phenomenalism in regards to the sensible features of the world [what Boyle coined 'primary' and a representative or indirect realism in regards to intelligible features of the world [what he coined 'secondary'].[287] That means to a certain degree we hallucinate the sensible features of the world, no matter how consistently, which means we are 'awake' only towards a limited subset of that world if any.

In that view, the *Meditationes* marks *the ground zero for a specific vector in the history of*

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[287] Where Descartes supposed the existence of a *materia subtilis* and of *globuli* and the vortices out of which the world was naturally steered into existence by God, Boyle thought as necessary that "… an Intelligent and Wiſe Agent ſhould contrive the Univerſal Matter into the World, (and eſpecially ſome Portions of it into Seminal Organs and Principles,) and ſettle the Laws, according to which the Motions and Actions of its parts upon one another ſhould be regulated (*The Origine of Formes and Qualities*, 193)… Noting that even in the scholastic worldview all agents act through qualities [indeed they are the *formæ operationis*]. While Descartes focused on "what they <qualities> do upon the organs of sense, then what changes happen in the objects themselves to make them cause in us a perception sometimes of one quality and sometimes of another" ["effects upon the organs of sense," "occasions pain"] Robert Boyle (1627-1691) meant to treat qualities themselves. To that effect, he took the old scholastic distinction between primary qualities (hot, dry, cold, hot) and secondary qualities (soft, hard, etc.)—both sensible in principle, if not in their purity (*The Origine*, pp. 2-3—and recast it in corpuscularian terms. Our ideas of secondary qualities bear no resemblance to their causes, (though our ideas of primary qualities do), though they depend on them (*The Origine of Formes and Qualities*, 43).

ideas that led to the kind of absolute idealism we countenance in Berkeley and Collier. Berkeley believed that when Descartes challenged the consistency of, say, a mind-independent hotness, or the formal truth of statements like 'the fire is hot,' he set off a process, that would not be completed until all ideas had been purged of their material counterpart in the real world.

Just as the corpuscularian stage marked the idealization of sensible qualities, or the rise of occasionalism marked the deification of causal agency, Berkeley will suggest *desubstantiating* all qualities, including the primary ones, in confidence that the immaterialist philosopher merely extends against the corpuscularian the same kind of critique the latter had already directed against the scholastic. So that that initial motivation behind divesting the material *substratum* of a part of its qualitative make-up should be carried out even further by admitting the ideality of all qualities and quantities as such. In that view, when Descartes challenged the material truth of mind-independent hotness, and the formal truth of statements like 'the fire is hot,' he had enabled a process that would not be complete until *all* ideas had been purged of their material counterpart in the real world. By the end, Descartes's selective skepticism in regards only to the irreparably confused contents of the world, seemed to have given way to an indiscriminate skepticism about anything 'lying behind' the screen of our ideas, regardless of how clear and distinct they are.

IV.3 World without Thought

George Berkeley (1685-1753), self-proclaimed immaterialist philosopher, thought the notion of the world as that unconscious place we habitually refer all our conscious perceptions and direct all our actions to, had grown irrelevant by his time. Those developments among the post-Cartesians suggest that whatever portion of reality is external to thought was being pushed further away from our grasp towards the vanishing point of all possible characterization; so much so, in fact, that by the turn of the eighteenth century, the external world seemed to a young George Berkeley just enrolled in Trinity College, Dublin, to have already been whittled down to something looking all the more like that featureless substratum the Scholastics referred to as *prima materia*. In a matter of a few years after his matriculation, Berkeley would write in his student notebook that: "World without thought is *nec quid*, *nec quantum*, *nec quale*, &c."[288]

The phrase *nec quid, nec quantum, nec quale* was the classic periphrasis for *prima materia* that appeared in Latin in translation of *Metaphysica* Zeta 3, in the course of determining what things identified as *ousiai prōtai* consisted in. By '*ousia prōtē*' Aristotle referred to such things as this dog, or that man, i.e. singular things that get to have unique names. So far as the pure logical analysis of the *Prædicamenta* goes, a unit of Being is identified by their resistance to any further predication, just as the name that it answers to cannot be said, strictly speaking, of any other thing in the history of the entire world. The ability of a being to function as a *hypokeimenon* [*τό ὑποκείμενον ἔσχατον*] or the most basic *subiectum* in common discourse [*ὃ μηκέτι κατ' ἄλλου λέγεται*], is one mark of substantiality, the other being its ability to exist as an

[288] *Commonplace Book, The Works of George Berkeley,* ed. A. C. Fraser. Oxford: Clarendon Press, 1901 I: p. 59.

independent and determinate being [*ὃ ἂν τόδε τι ὂν καὶ χωριστὸν ᾖ*][289], both of which criteria survived down to the early modern times in Descartes.[290]

But relying on the first logical criterion alone, to wit, supposing a thing is more real to the degree it is less predicable of other things forces us to locate the epicenter of being we began with, say Socrates, further down below any given quality and toward the vanishing point of any possible predication. But such a level of analysis is foreign to the original intuitions that led us identify him as a primary substance [*οὐσία πρώτη*, *substantia prima*] in the first place. The arrival on something that fails to be a *τόδε τι* and a *χωριστὸν* forces Aristotle to resume the study of Being qua Being on a different basis, and assume *μορφὴ* as a principle of being and the whole concrete entity as the real subject of whatever can be stated truly about it.

Aristotle's lesson is that by denying the subject-attribute relation from reality, i.e. to not approach the world as the 'snub' [*sicut simum*], or intrinsically structured in forms and matters, we miss the mark originally set by metaphysics as a discipline, i.e. to study the being of such things we recognize as subsistent [*χωριστὰ*] and determinate [*τάδέ τινα*]. By confining all that is formal to the mind, and its ability for predicating [*κατηγορεῖν*, *predicare*] there simply remains no purchase to say anything intelligible about the world apart from being a global yet featureless subject of anything we may think about it.

So the turning point in the historical tradition Berkeley finds himself in, looking once

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[289] "συμβαίνει δὴ κατὰ δύο τρόπους τὴν οὐσίαν λέγεσθαι, τό θ' ὑποκείμενον ἔσχατον, ὃ μηκέτι κατ' ἄλλου λέγεται, καὶ ὃ ἂν τόδε τι ὂν καὶ χωριστὸν ᾖ: τοιοῦτον δὲ ἑκάστου ἡ μορφὴ καὶ τὸ εἶδος" (*Met*. Delta 8, 1017a 10ff).

[290] One was offered as part of a recasting of the argument of the *Meditationes* in *more geometrico*: "V. *Substance*. This term applies to every thing in which whatever we perceive immediately resides, as in a subject, or to every thing by means of which whatever we perceive exists (*Objections and Replies, Second Set of Replies* CSM II: 114; AT VII, 161)." The other is offered in the *Principia*: "By *substance* we can understand nothing other than a thing which exists in such a way as to depend on no other thing for its existence" (*Principles of Philosophy* I.51, CSM I: 210).

again for the essence of the external world, seems to have recapitulated the turning point in Aristotle 's *Metaphysica*, both relying on the absurdity of the claim that the world consists in something that is beyond any positive or even negative determinations; or, that the world as the sum of all that exists beyond our thoughts has no form in and of itself apart from the properties we project onto instead of reading off of it.

Much earlier than Berkeley, the *prima materia* had already been found an obscure and totally unnecessary metaphysical relic passed down to the seventeenth century through past iterations of the Peripatetic system. It is certainly not by accident that the end of the medieval notion of a featureless *substratum* that can be anything but is nothing in the turn of the 17th century, marks the beginning of the first rationalist systems of thought. For, in matter the champions of natural reason saw something scientifically meaningless; an essentially unclear and indistinct given; impossible to be enacted in thought, be it a finite or an infinite intellect.

Descartes explicitly rejects prime matter in the cosmogenesis of chapter VI of *Le Monde* (c. 1630) [along with any kind of potentiality in the definition of *motus* (*Ibid.* ch. VII)].[291] He had also denied any metaphysical import to the different way of saying "extension" and "thing being extended," effectively annulling centuries-worth of discussions about the relation of prime matter and quantity from the Islamic Golden Age to High Middle Ages down to the Renaissance. If anything, such a *prima materia* could be considered a good candidate for what Descartes framed as materially false ideas, and like other privative terms such as darkness, rest and cold (some of which were in fact used to describe the *obscurum per obscurius)*, merely be different names for

[291] Descartes explicitly rejects prime matter in chapter VI of *Le Monde,* "Et ne pensons pas aussi d'autre côté qu'elle soit cette matière première des Philosophes, qui' on a si bien dépouillée de toutes ses formes & qualitez, qu'il n'y est rien demeuré de reste qui puisse être clairement entendu" along with any kind of potentiality in the definition of *motus* (*Ibid.* ch. VII).

nothingness that arise from human imperfection. Indeed, nothing could be further away than this elusive *substratum* from the spirit of Cartesian philosophy. Such relics of ancient metaphysics as prime matter were of course cleared away on the onslaught of Cartesian identification of substance with their principal attributes. After all, its exclusion was excluded with the force of an eternal truth that prescribed that "only nothingness possesses no attributes" [*nihili nulla sint attributa*][292] and whose converse [if there is an attribute there also must be a substance] was used to adduce the existence of a substance from the notion of a real attribute.[293]

In his *Scepsis Scientifica* (1665), Joseph Glanvill (1636-1680) too thought that prime matter is "as opposite a definition of Nothing, as can be" (Ch. XVIII, p. 111) and a "Modern nothing" (*ibidem*, 112).[294] Malebranche too thought that the supposition of prime matter must be a result of arguing with logical notions about natural things (*De la Recherche de la Vérité* [Paris: André Pralard, 1674-5] Book III. Ch.VIII). But when John Norris (1657 – 1711), the Cambridge Platonist, discusses the notion of *prime matter* in Part I of *An Essay Towards the Theory of the Ideal or Intelligible World* (London, 1701) as bequathed to his generation by Francisco Suárez (1548–1617)[295] he takes Suárez's argument for the existence of first matter to share the same form with Descartes's argument for the existence of his own self, both relying on the principle:

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[292] *Principia* I: XI, AT VIII: 25 ll 7-8 also I: LII.

[293] And yet, when forced by Hobbes to … he admits that: "… we do not come to know a substance immediately, through being aware of the substance itself; we come to know it only through its being the subject of certain acts" (*Objectiones Tertiæ*, AT VII: 176; CSM II: 124). And later on, to Arnauld: "We do not have immediate knowledge of substances, as I have noted elsewhere. We know them only by perceiving certain forms or attributes which must inhere in something if they are to exist; and we call the things in which they inhere a 'substance'" (*Quartæ Responsiones* AT VII: 222; CSM II: 156)

[294] … *Nec quid*, *nec quale*, *nec quantum*, is as oppoſite a difinition of *Nothing*, as can be. So that if we would conceive this *Imaginary Matter*: we muſt deny all things of it, that we can conceive, and what remains is the thing we look for (111) … So then there's nothing *real*, anſwering this Imaginary *Proteus*; and *Materia prima* hath as much of being, as *Mons aureus* (113) [Joseph Glanvill, *Scepsis Scientifica* [London: E. Cotes, 1665)] Ch. XVIII.

[295] Citing *Disputationes Metaphysicæ*, 2 vols. (Salamanca: Ioannis et Andreas Renaut, 1597) Tom. I, Disp. 13. Sect 5. Num. 9),

nihilo nihili attributa sunt:

> *Suarez* proves that firſt matter is not ſo a *pura Potentia* but that it has ſome entative Actuality belonging to it, that is, that tho' it be in *purâ potentiâ* as to any formal Act, yet it is not in *purâ Potentiâ Objectivâ* as to reality of Being, but is a real ſomething (however incomplete) and actually *extra Nihil*. But how he prove it? Why he proves this entative actuality of firſt matter from the very attribute of its Potentiality. *Becauſe the firſt Subject* (ſuch as he there ſuppoſes firſt matter to be) *muſt neceſſarily have a real Paſſive Power, but ſays he a real Paſſive Power cannot be underſtood without ſome entative Actuality. For* (ſays he) *how is it poſſible to conceive that any thing ſhould be truely and really receptive of another unleſs it be ſomething in it ſelf. ... Des Cartes* reaſons in the very ſame method in his laying the firſt Foundation of Philoſophic Science. *I think*, or I am thinking, … *therefore I am*. He argues from his having the attribute of thinking belonging to him to his Exiſtence.[296]

Following up in his *Clavis Universalis* (London, 1713) Arthur Collier (1680-1732) found that a survey of the extant meanings attached to philosophical matter—from Aristotle to St. Augustine, Porphyry, Caesar Baronius and Christopher Scheibler—would indicate that, rather than reveal the nature of any material world they "never deſigned any other than to amuſe the *Ignorant*, but yet to give every Intelligent Reader an *Item*, by this Procedure, that the *Matter* they are ſpeaking about is *nothing at all.*"[297] As such, *prima materia* is essentially demoted to a tool that serves the same rhetorical function as that of golden mountains, square circles and other illustrations of nothingness. And since there are arguments that rely on the notion of a *prima materia* to save the appearances of an external world, Collier goes as far as to claim that any argument in favor of a *prima materia* is just as good an argument against the belief to an external world as it is in favor of it. Saying that the reality beyond our mental worlds is supported by a featureless substratum is just a covert way of denying the existence of an external world for an audience of

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[296] John Norris, *An Essay Towards the Theory of the Ideal or Intelligible World* (London: Ship in Cornhill, 1701), part 1, §51-2, p. 78-9.

[297] Arthur Collier, *Clavis Universalis, A New Inquiry after Truth, being a Demonstration of the NonExistence or Impossibility of an External world* (London: R. Gosling, 1713), ch. IX, arg. IX, 111.

educated readers without offending the common sense of the ignorant.

To combine then the meaning Collier and Glanvill attached to prime matter with Berkeley's impression that "world without thought is *nec quid*, *nec quantum*, *nec quale*, &c." is one logical step away from claiming the world without thought does not exist.

IV.4 Historicizing error

Within a *corpus* otherwise devoted to show the notion of matter poses a philosophical liability, there are two instances where Berkeley advances a different question: If matter is the sort of chimerical notion he is presenting it to be, what were the original motives that gave rise to a prejudice so resilient? And, even if, over the course of evaluating its coherence and usefulness, nothing positive can be affirmed of matter, can there perhaps still be offered "an account for its obtaining in the world?" In the same way we might be curious today to explain, say, how such a misguided practice as bloodletting rose to such widespread application across the world, from late antiquity down to the very time of Descartes's death, if not later, can there be a true and rational history for the inception of something false?

Descartes showed how certain ideas can be suspect of *material falsity*—a term borrowed by the Jesuit Francisco Suárez—which Descartes understood it as the mind's presenting to itself non-things as things [*falsitas materialis in ideis, cum non rem tanquam rem repraesentant* (AT VII: 43)], i.e. ideas of a reality so slight, such as dark, cold, immobility—and to that effect prime matter—that could easily be a result of an overreach of the mind, rather than occasioned by anything *in rerum natura*. They may proceed from *ex nihilo*—'nothingness' here expressing the state of a mind left in its own devices in composing an *impossible object* or an idea containing an extremely attenuated objective reality [*lumine naturali notum mihi est illas a nihilo procedere, hoc est, non aliam ob causam in me esse quam quia deest aliquid naturæ meæ, nec est plane perfecta* (AT VII: 44)]. So, to attribute existence to such a thing would be no less misguided than to attribute existence to a privation like nothingness, death, evil, blindness, or darkness, adding up to a long list of empty privative terms in the history of thought and just as many reasons to find the

collective human understanding defective. Even if not obviously incoherent, such notions are so devoid of any positive meaning that raise suspicions as to whether they be *of anything* at all, that being an intrinsic condition for the existence of an idea, since *nullæ ideæ nisi tanquam rerum esse possunt* (AT VII: 44).

In many ways, such an argument is motivated by similar considerations that made possible the ideological proof for the existence of God in *meditatio tertia*. The argument for the non-existence of what privative terms make reference to from the scarce objective reality they hold, is the converse of the ideological proof for the existence of God, defined as *aeternus, infinitus, omniscius, omnipotens, rerumque omnium, quæ praeter ipsum sunt creator* (*Med.* [1641] 41, || 5-7, AT VII: 40). In the fourth meditation, Descartes admits of our having an idea *realis et positiva* of God as a *ens summe perfectum* and on the other limit of the spectrum of the real, we have an idea *negativa* of nothingness, *nihil* or *id quod ab omni perfectione summe abest*. Just as an idea with only a slight degree of objective reality is suspected for being fictitious [*fictum*], and points back to the mind as its author, an idea with more objective reality than a mind is capable of ever fashioning by itself draws us to something without. It must originate in a being that contains at least as much reality as what is represented in the idea, if not more (*ibid.* || 11-13); our lacking the resources or processes to put together such an elaborate engine that the nature of God's is, indicates it is a complex unity the mind happens to have stumbled across, instead of having fashioned together. Now, if an idea of a greater objective reality that I could ever possibly fashion must come from something outside of me, the idea of such a slight objective reality as a *prima materia*, no less than the idea of darkness or coldness or other privative notions, can most likely come from within me, insofar as I am an imperfect being, it is a *nihil* coming *ex nihilo*. So, the

inverse of the argument for the necessary existence of God outside of me, would be an argument for the highly improbable existence of matter outside of me.

Bacon, Descartes, Spinoza, Hobbes, Boyle were some of the early modern authors who realized the rhetorical power of explaining away the entities they meant to discredit, by showing they had been suggested to the mind neither by the nature of the real, nor by the nature of philosophical discourse. This approach would not focus on *formal error* as found, in the tradition of the *Elenchi*, in cases of spurious reasoning against the formal rules of the syllogistic, or the semantics of its terms, but the *material error* committed in the reification of something unreal. As a species of *ad hominem* argument, it became emblematic of those first explicitly polemical critiques of the natural philosophy of 'the Schools' in the first half of the seventeenth century. It suggested an item of belief be evaluated and accounted for, not merely in terms of its conceptual merits, but also in terms of the nature of its origins. As the Peripatetic thought-structure seemed to have been developed for saving the appearances of common-sense facts like 'the fire is hot,' it sided with intuitions that emerge naturally in the individual's first encounters with the world. So, another way to challenge their givenness, beyond the humanist model of *rationibus & facultatibus*—i.e. to support a position both by arguments and authorities—was to consider them as episodes in the development of thought. Though some ideas and their concatenation into theories were shown to be materially false in themselves, i.e. to be about nothing but a lapse of judgement, considered as habits of thinking, they were subjectable to a history of their inception. The cognitive circumstances surrounding the inception of such ideas or predispositions might then reveal ties to a more innocent stage in the concept-development of the individual or a less enlightened stage in intellectual history at large.

So a privation in thought, though lacking any objective reality could be presented as a product of some real mechanisms of thought no matter how abused, in combination with the consolidating effects of custom.

Francis Bacon held that his own version of *material falsities* called 'Idols' in his *Novum organum*[298] are related to the interpretation of nature, as the doctrine of the *Sophistici Elenchi* was related to popular dialectics.[299] In that spirit, Bacon considers *prime matter* and atoms as two equally misguided limits of abstracting [*abstrahere*] and cutting [*secare*], both of which he seems to reject.[300] Robert Boyle explains in *The Origine of Formes and Qualities* (Oxford, 1666) that since our acquaintance with sensible qualities is prior to our use of reason and the mind is "prone to conceive almost everything (nay, even privations, as blindness, dewth, &c.) under the notion of a true entity or substance, as itself is" we have been "from our infancy apt to imagine that the sensible qualities are real beings in the objects they denominate,"[301] an argument also used by Descartes in *meditatio sexta* (AT VII: 75) to explain away the scholastic adage *nullam plane me habere in intellectu, quam non prius habuissem in sensu*. In his *Meditationes de Prima Philosophia* (Paris, 1641) Descartes is regularly found juxtaposing the ahistorical nature of the evidence of the *lumen naturale* with the historical-biographical dimension of the teachings of nature—in terms of an *impetus naturalis* or a *realis sive positiva propensio*—and our habits of making judgments on them from a very early age. The meditator admits to habitual opinions he

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[298] *Francisci de Verulamio ... Instauratio Magna* (London: Joannis Billium, 1620).

[299] "Doctrina enim de idolis similiter se habet ad interpretationem naturae, sicut doctrina de sophisticis elenchis ad dialecticam vulgarem" (*Nouum Organum,* I.XL); "Intellectus humanus fertur ad abstracta propter naturam propriam; atque ea, quæ fluxa sunt, fingit esse constantia (*Nouum Organum* I.LI)"

[300] "Hinc fit, ut abstrahere naturam homines non desinant, donec ad materiam potentialem et informem ventum fuerit ; nec rursus secare naturam desinant, donec perventum fuerit ad atomum" (*Nouum Organum* I.LXVI)

[301] *The Origine,* IV: 31; Boyle also explained our willingness to suppose a real power or faculty for any diverse effect produced by our inability to see how the same agent may be diversified by the patient bodies or certain material requirements for their operation (*Ibid*, 27).

finds himself bound to by *longo usu & familiaritatis jure* [*Recurrunt consuetæ opiniones, occupantque credulitatem meam tanquam longo usu et familiaritatis jure sibi devinctam* (AT VII: 22)]; in fact, the attempt at self-deception towards the end of *meditatio prima*, personified by the *genius malignus*, was introduced as a radical means for shaking off such deeply-entrenched opinions.

Arnold Geulincx (1624-1669) in particular, a Flemish medical student in Holland and one of the first propounders of occasionalism in the Cartesian tradition, had contemplated a very interesting account about the various ways and degrees we are willing to ascribe our own modes of sensing and thinking to our self, our body or the things themselves, offering an account of the emergence or the inception of matter, as it were. Our tendency to ascribe to the environment one kind of qualities as opposed to others has to do with the order these qualities appear in the course of fetal development. We tend to exteriorize sensible perceptions as they apper later in our acquaintance with the world.

In his introduction to his *Metaphysica Peripatetica*, Section II entitled: "The proneness of the human mind to affix the manners of its own thinking to the things thought [*Pronitas humanæ mentis ad affigendum modus ſuarum cogitationum rebus cogitatis*]" Geulincx will go as far as reading in the history of thought at large, the same developmental story of the individual in its awakening into the world, according to which "the Peripatetics are likened to children." For example, passions of the body-soul machine like hunger, thirst, fear and anger arrive so early in the development of consciousness, that the self ultimately recognizes them as parts of itself, even if they manifest in certain bodily affections. We say that *we* are hungry, or *we* are thirsty and even if there are manifest signs of these states like tingling sensation in the stomach, or dryness in the

mouth, we do not say 'our mouth is thirsty' or 'our stomach is hungry.' Pains and titillations on the other hand appear later on, which affords us a degree of separation of the affect and its localization in claims like 'my hand hurts.' Sense-ideas come last in all their vividness and multiplicity *post partum*, so the self naturally ascribes them to something beyond the self. Geulincx believe the degree that an affection or a quality is to be attributed to the environment *extra anima* and *extra corporem* depends on what stage in the development of the conscious self are first encountered. So the Peripatetic philosopher represents the child-stage in a coming-of-age story of thought as it gradually recognizes itself as the proper subject of its sense-ideas.

> Since we have first been enclosed in the uterus of our mothers and we have spend a considerable amount of time in these prisons, our reason being chained and restricted (and not without a reason, say the Christians); hence we do not so much exercise either our sight or our hearing, or any other sense; however we have been affected by HUNGER and THIRST and PASSIONS in the same manner perhaps with our mothers, in bodies of whom our bodies are included, and since they seem to constitute a unity, as it were, with them. But after some months after birth, brought to light and coming forth out of our dark prisons, there are infinite other things which we had ignored before, that act in our bodies, and they begin to cast their species into our souls: first LIGHT and an infinite variety of COLORS, none of which can be found in that chimerical state (OR union); then SOUNDS, if some of who occurred to us while remaining in these prisons, certainly they did not do so but weakly. Likewise about SMELLS and TASTES, and likewise about HEAT and COLD and all other similar tactile qualities; … This is why we would not refer those species, and whatever is offered to us, to those qualities themselves, but to our very selves. But brought into light as I said, and being affected by an infinity of new species, since we would rightly consider what we had had before as ours, we right then begin to ascribe those species to the new things that surround us. Indeed, we had considered us complete before, as it were, and so if something new happened to us, we would refer it to those things received, which we take to be the occasion of that novelty. Hence also that diversity which holds between the sense of pain and or titillation (which we attribute to our body) and the rest of the senses (which we ascribe to objects), can be explained.[302]

As far as Berkeley is concerned, if it could be shown that the doctrine of matter arose

[302] Arnold Geulincx, *Opera Philosophica*, ed. J P. N. Land (Hague: M. Nijhoff, 1892) II: 200-209.

from a different source than the nature of things—say the apprenticeship with nature, an uncritical reliance on authority, or the illegitimate use of a cognitive function—, it could be treated as a symptom. Most importantly however, if Berkeley could show—as Descartes did about the irreparably confused notions of coldness or of heat existing in the fire itself—that the notion of matter can arise *ex nihilo*, it would be excluded from the order of creation and just as God is not to be imputed with "every epidemical opinion arising from prejudice, or passion, or thoughtlessness" (*Dialogues*, 90-91), the fact that a matter is naturally suggested to us as the subject of all our qualities would not turn us into victims of a mass infirmity, and whatever semblance of truth *meditatio sexta* had would be successfully circumvented.

IV.5 The Three Epochs of Vanishing

More in tune with his own immaterialist ambitions, Berkeley engages in these reflections with the expectation that the 'spell' of matter would be broken in proportion as its initial motivations proved to be misguided:

> It is worth while to reflect a little, on the motives which induced men to suppose the existence of material substance; that so having observ'd the gradual ceasing, and expiration of those motives or reasons, we may proportionably withdraw the assent that was grounded on them.[303]

So, in addition to offering a plausible *pathology* for the prejudice of matter, such an account of a belief system in gradual decline has the rhetorical advantage of making the author's opinions side with history. For in such a sketch for *a history of the idea of matter*, Berkeley locates his immaterialist metaphysics as a terminal inevitable stage in the gradual vanishing of matter from philosophical discourse.

One of these two passages as found in his *Treatise*, reads as follows:

> But it is demanded, that we assign a cause of this Prejudice, and account for its obtaining in the World. To this I answer, **[1]** That Men knowing they perceiv'd several Ideas, whereof they themselves were not the Authors, [a] as not being excited from within, [b] nor depending on the operation of their Wills, this made' em maintain, [c] those Ideas or Objects of Perception had an Existence independent of, and without the Mind, without ever dreaming that a Contradiction was involved in those Words. **[2, 3]** But Philos[o]phers having plainly seen, that the immediate Objects of Perception do not Exist without the Mind, they in some degree corrected the mistake of the Vulgar, but at the same time run into another which seems no less Absurd, *viz*. that there are certain Objects really Existing without the Mind, or having a subsistence distinct from being perceived, of which our Ideas are only Images or Resemblances, imprinted by those Objects on the Mind. And this Notion of the Philosophers ows its Origine to the same cause with the former, namely their being conscious that they were not the Authors of their own Sensations, which they evidently knew were imprinted from without, and which therefore must

[303] *A Treatise Concerning the Principles of Human Knowlege* I: §73.

have some cause, distinct from the Minds on which they are imprinted.[304]

Berkeley tells us that, upon being exposed with objects they do not recognize as their own creations, people are led to confer an existence "independent of and without" the mind; not *just* their own, but *any* mental reality whatsoever. Later on, it was superseded by another equally misguided view: the supposed subsistence of objects that are so many archetypes or originals of the images imprinted in the mind. This view is imputed, if not directly to followers of Descartes that were hypothetical realists in regards to the intrinsic properties of extension (so far as *meditatio sexta* can show), to the degree they believed the primary qualities of matter as we understand them as well as the secondary qualities as the power of the former, are really possessed by something outside of the mind, if not formally at least eminently.

Over the second passage, §73 (cf. 2nd Dialogue, p. 60), Berkeley elaborates on the kind of subsistence that was attributed to real accidents: since sensible qualities are material, accidental forms, they could not exist on their own; they were supposed to inhere in a material *substratum*, and their *esse* be *inesse subjecto* or *esse in alio*. Just as an immediate object of perception is subjected to a thinking substance—a mind, as a condition for its existence—a real quality or attribute was supposed to be subjected to an unthinking substance, a non-mind, in and of itself.

> **[1]** First, therefore, it was thought that Colour, Figure, Motion, and the rest of these Sensible Qualities or Accidents, did really Exist without the Mind; and for this reason, it seem'd needful to suppose some unthinking *Substratum*, or *Substance* wherein they did Exist – since they cou'd not be conceived to Exist by themselves.

Indeed, after the nature of accidents defaulted to the pre-fourteenth-century account of

[304] *Principles* I: §56, pp. 98-99.

Albertus Magnus, Thomas Aquinas, Siger of Bramant, William of Auvergne[305] that described them merely as modes of substances, as opposed to being declared real and separable in the fourteenth and beyond, the consensus was that accidents cannot subsist apart from their subject: *quæ in subiectis habent esse*, *suum esse sit in alio* (Piccolomini [1547] fol. 87v−88r; *sine re substante* (Locke's letter to E. Stillingfleet) or such things cuius *esse est inesse*, *entia entis* (Boyle). But that initial direct realism in response to all sensible qualities was superseded by a realism in response to just a set of them—coined *primary* by Robert Boyle (*Origine*, 1666)—including size, shape, motion, rest and texture:

> **[2, 3]** Afterwards, in process of time, Men being convinced that Colours, Sounds, and the rest of the Sensible, Secondary Qualities had no Existence without the Mind, they stripped this *Substratum* or material Substance of those Qualities, leaving only the *Primary* ones, Figure, Motion, &c. which they still conceived to Exist without the Mind, and consequently, to stand in need of a material Support …[306]
> **[4]** … But, it having been shewn, that none, even of these, can possibly Exist otherwise than in a Spirit or Mind which perceives them, it follows, that we have no longer any reason, to suppose the being of *Matter*. Nay, that it is utterly impossible that there shou'd be any such thing, so long as that Word is taken to denote, an *unthinking Substratum* of Qualities or Accidents, wherein they Exist without the Mind.[307]

For the sake of convenience, it may be periodized in: [1] the *Scholastic*, [2] the *Corpuscularian*, [3] *Instrumentalist*[308] *& Occasionalist* and [4] the *Immaterialist* stage.

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[305] Professor Pasnau has argued (Pasnau, 180) that the doctrine of real accidents was merely an episode, beginning 14th century, in a long philosophical tradition of treating accidental form as non-self-subsistent. He affirms that: "When seventeenth-century authors in turn reject the "real accidents," they are in many cases returning to the sort of view that was first in favor among scholastic authors," like Albert, Thomas etc. While he offers the due complexity in the relation between quality realism and separability.

[306] *Principles* I: §73, pp. 118-119.

[307] *Principles* I: §73, pp. 118-119.

[308] Arnold Geulincx *instrumentalism* already expressed in his *Metaphysica* written in 1666 and published posthumously in 1691, a matter that is cabable of diversification is employed by a simple God to impress diverse thoughts on simple minds. The diversity of the instrument is required on pain of calling the diversity of thoughts mysterious and ineffable (*Metaphysica Vera* I, *septima scientia*); and the *instrumentum* is related to the *effectum* as a pen with the capacity of writing but which does not write on its own account. Geulincx offered an argument for the existence of corporeal nature as necessary to the divine conservation, effectively rendering the uninstrumentalized excitement of a multitude of things into single minds impossible, even to an infinite mind, due to its simplicity.

IV.6 Recapitulated in the Dialogues

When a couple of years later he felt compelled to show the immaterialist hypothesis is not as outlandish as it first sounds and it is perfectly agreeable with common sense and religion,[309] he chose to lay down his views in dialogical form. The *Three Dialogues* (London, 1613) offers a more fine-grained version of this timeline in a dialogical form, following Hylas's (from *hylē*: 'mr. Matter') conversion from his naive realism to immaterialism.

Over the course of the dialogue, as if recapitulating the path in intellectual history outlined in the earlier *Treatise*, Philonous (the 'lover of mind') objects to whatever positive feature his interlocutor, Hylas, attaches to matter from its conceptual history.

> [A]t first, from a beliefe of material substance, you would have it that the immediate objects existed without the mind; then, that they are archetypes; then, causes; next, instruments; then, occassions; lastly, *something in general*, which being interpreted proves *nothing*.[310]

In the *First Dialogue*, Hylas proceeds from (1) a *direct realism* in regards to all sensible ideas; to (2) a *direct realism* in regards to a selection of those sensible ideas called *primary*; and to (2b) *representational realism* in regards to some ideas and their combinations [mixtures?]; The *Second Dialogue* begins with a doctrine of (2c) *non-representational realism of powers of primary qualities*, at which point (4) the *immaterialist thesis* is put forward (p. 55). Closely following up next, and throughout the second dialogue, Hylas attempt to interject between the two spirits (man and God) of the immaterialist thesis: (3a) a third nature as a limited cause of our ideas, subordinate to God as the supreme and universal cause of all things (p. 59); (3b) matter of the

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[309] He meant to present the notions introduced in the *Treatise* "in the most easy and familiar manner," especially because "they carry with them a great opposition to the prejudices of philosophers which have so far prevailed against the common sense and the natural notions of mankind" (*Three Dialogues*, *Preface*, p. 6.).

[310] *Second Dialogue*, p. 68.

corpuscularian concurring with its motion to the production of ideas by God (p. 61); (3c) to an instrument void of sensible qualities, extension even (p. 62); (3d) an unthinking substance offering some *fixed & regular occasions at the present of which ideas are excited in our minds* (p. 64); The *Third Dialogue* finds Hylas arrested by a general agnosticism about the internal constitutions and natures of things, before his eventual endorsement of the immaterialist hypothesis.

By being guided to prescind any positive element from the meaning of 'matter' that bears the mark of mental activity, Philonous guides Hylas to revisit philosophical attitudes in roughly the same order they were introduced in the history of thought. Just as **[1]** the whole Scholastic lot a personified by the Hylas of the *First Dialogue* is convinced of the heat and the color being in the fire; **[2]** so the first wave of Cartesian corpuscularians is personified by a Hylas who holds only extension and motion to obtain in the world *prout se ipso*; later, **[3]** the post-Cartesian vague materialists are personified by a Hylas that finds himself still trying to interject some *occasion*, *instrument* or *thing in general* between the world of experience and the divine will. When Berkeley reaches this vanishing point of all determinations in the *Dialogues*, he comes close to what would be commonly called *prima materia*, which was understood by Thomas as pure potential being. And just like the attrition of matter—understood by the first criterion of substantiality—as a subject for whatever we may predicate of it ends up with the pure *negative idea of substance* close to the end of the *First Dialogue* (p. 40); matter as defined by the causal criterion degenerates into the general abstract idea of *entity*, or *something in general* (p. 66-68) what we may call *vague materialism*.

History writ large, like Hylas in particular, seems to have been pushing matter beyond the

intelligible and into the darkness of a mere *nec quid, nec quantum*, *nec quale*,[311] which Philonous (like Collier and Berkeley) takes to be as good a description of nothing as one can get.

[311] *Commonplace Book,* cited earlier.

IV.7 A valid Motive drawn to False Conclusions

Berkeley identified these four stages in the vanishing of matter, over which the mind recognizes all the more signs of its own mode of being in the external world. Still, behind the aforementioned motivations blamed for the entrenched prejudice that is the doctrine of matter, there lies a core of some deep intuitions that seem connatural to any form of reasoning about existence beyond one's self. For the sake of a continuity that would place immaterialism as the ultimate outcome of that chapter in the history of ideas, and not a turning point, Berkeley thinks the doctrine of matter is a misguided answer to an otherwise valid and worthwhile philosophical *aporia*, one in fact which cannot be left unanswered on pain of succumbing to a similar skepticism as Hylas finds himself in, at the beginning of the *Third Dialogue*.

For any kind of attribute a given ontology is willing to admit of its pertaining to the world as such, as opposed to merely be a creature of the mind, there is the same intellectual need to ascribe them to something external, to render them concrete; only, where the scholastics lot affirmed the natural subsistence of all sensible qualities—with the exception of color and, more rarely, light [cf. G. Fracastoro's *De Contagione* (1546)]—the first corpuscularian accounts saw the attribution to the world of only such qualities that were thought inseparable from body: Bacon's *Valerius Terminus* (1603) and the *Novum Organum* (1620), Galileo's *Il Saggiatore* (1623), Descartes's *Regula* XII [c. 1626-8]; Boyle's *Origine* (1666)].

So in order to make the notion 'matter' liable to historicization and to projections of its eclipse, Berkeley relies on a notion wide enough to be answered throughout all preceding periods. Yet, since he wants to remove matter without removing the world, he also understands it strictly enough to allow an alternative to a world *extra animam*. So, the intellectual need to sup-

pose a *substratum* for the subsistence of qualities (in exactly the same way we immediately perceive them or some eminent way), is for Berkeley as natural as it is still relevant. The matter that deserves vanishing for Berkeley is that "stupid, thoughtless *Somewhat,*"[312] or "an extended, solid, movable, unthinking, inactive substance,"[313]—how Berkeley perceives the matter of the Newtonians—a world *prout in se ipso est*, and subsisting outside of any act of perception. There is no fault in expecting concrete qualities to inhere in subjects, but rather it is the speculation about the nature of that subject.

It is safe to assume that, by 'matter' in these passages, Berkeley means, least strictly defined, that which subsists outside of the *self*, howsoever that self is demarcated. But of course, Descartes and the Cartesians were also motivated by the need to differentiate dream from reality. So whatever exists *extra me posita* or *res extra animam* is the world we naturally assume to exists in order to avoid admitting we that might as well live in a self-imposed dream. Since Berkeley needs to vanish matter without vanishing a world *extra me*, he will side with all his predecessors in wanting to outsource certain involuntary mental states to the world beyond the self, but not in being of any other kind of *stuff* than "the stuff dreams are made on."

By having conjured up an *abstract idea of existence* that extends beyond everything thinking and everything thought—i.e. the only kind of being we can actually attest to—philosophers supposed the world beyond the self is of a completely different nature than thought—no less so than, say, a weapon that strikes the flesh is of an entirely different nature than the internal pain it inflicts. So the prejudice consists in the supposition that the dream is distinguished from waking life by a *different nature* that settles the truth of our perceptions.

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[312] *Principles* I: §75, p. 120.

[313] *Second Dialogue*, p. 60.

To those who might resist his scheme of ideas as having banished the real and the substantial out of the world, voiced by Hylas concern that there is going to be no difference "between real thing, and chimeras formed by the imagination, or the visions of a dream, since they are all equally in the mind" (*Dialogue* III, 97) Berkeley responds that: "there is *in rerum natura*, and the distinction between realities and chimeras retains its full force. … [W]e have shewn what is meant by *real things*, in opposition to *chimeras* or ideas of our own framing; but then they both equally exist in the mind, and in that sense are alike *ideas.*"[314]

In his early philosophical commentaries he understood ideas of imagination to stand to ideas of sense as the real things or archetypes stand to their copies (*Commonplace*, 461). But later he holds that reality differs from appearance as a confused dream differs from a lucid one: "The ideas formed by the imagination are faint and indistinct; they have, besides, an entire dependence on the will. But the ideas perceived by sense, that is, real things, are more vivid and clear; and, being imprinted on the mind by a spirit distinct from us, have not the like dependence on our will. … [T]here is as little of confounding them with the visions of a dream, which are dim, irregular, and confused. And, though they should happen to be never so lively and natural, yet, by their not being connected, and of a piece with the preceding and subsequent transactions of our lives, they might easily be distinguished from realities." (*Dialogue* III, 97-98)

In our attempt to absolve ourselves from the authorship of certain ideas that are inadvertently excited in us—an attitude that is, in and of itself, natural and valid—we look for ontological support and causal antecedents in matter, driven by the false presupposition that, *if some object of thought is independent from my will or yours, it must also be independent of all thought*

[314] *Principles* I: §34, p. 74.

whatsoever. But upon the removal of the prejudice of an ontological support that is material, inert, and unperceiving, Berkeley seems to imply, the immaterialist hypothesis follows from principles everyone would adhere to:

> It is acknowleg'd on the receiv'd principles, that **[1]** extension, motion, and in a word, all sensible qualities have need of a support, **[2]** as not being able to subsist by themselves. But **[3]** the objects perceiv'd by sense, are allow'd to be nothing but combinations of those qualities, and consequently **[4]** cannot subsist by themselves. Thus far it is agreed on all hands. So that in denying the things perceiv'd by sense, an existence independent of a substance, or support wherein they may exist, we detract nothing from the receiv'd opinion of their *reality*, and are guilty of no innovation in that respect. All the difference is, that according to us the unthinking beings perceiv'd by sense, have no existence distinct from being perceiv'd, and cannot therefore exist in any other substance, than those unextended, indivisible substances, or *spirits*, which act, and think, and perceive them.[315]

[315] *Principles* I: §91, pp. 136-137.

IV.8 Same principle, different theories

Berkeley meant to lay down a story of the vanishing of matter from intellectual history, in parallel of the vanishing of matter from the anthropological unit of Hylas. All these passages from the *Treatise* working together, Berkeley describes the transition from the scholastic to the corpuscularian stage as the application of universally acknowledged principles to different kinds of entities.

But if all these thinkers are equally committed to the dependent status of qualities, what determined the attribution to the world of one kind of them over the other?

> Qu[estion]. How comes it that some ideas are confessedly allow'd by all to be onely in the mind, and others as generally taken to be without the mind, if, according to you, all are equally and only in the mind? (*Commonplace*, 449).

What motivated the corpuscularian philosopher to restrict the qualities they are realist about to extension, motion, figure, texture etc.? In the *First dialogue* pg. 32, an explanation is given for the distinction between primary and secondary which Berkeley believes is misguided or lacking any *rational ground*:

> [A]mong other reasons which may be assigned for this, it seems probable that pleasure and pain being rather annexed to the former than the latter may be one. Heat and cold, tastes and smells have something more vividly pleasing or disagreeable than the ideas of extension, figure, and motion affect us with. And, it being too visibly absurd to hold that pain or pleasure can be in an unperceiving substance, men are more easily weaned from believing the external existence of the secondary than the primary qualities. … [316]
> … Ans[wer]. Because that in proportion to pleasure or pain ideas are attended with desire, exertion, and other actions which include volition. Now volition is by all granted to be in spirit.[317]

From his student notebook we read:

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[316] *First Dialogue*, p.33.

[317] *Commonplace Book*, in *The Works of George Berkeley*, I: 39.

> Extension thought peculiarly inert because not accompany'd wth pleasure & pain; hence thought to exist in matter, as also for that it was conceiv'd common to 2 senses, [as also the constant perception of 'em].[318]

The clarity and distinctness that Descartes finds in the ideas of extension, motion, figure etc. as opposed to the confused and indistinct sensations of pain, and which ultimately warrants their reality, is for Berkeley merely their appetitive neutrality as opposed to ideas we can clearly recognize as non veridical soul-passions. But actually there is no principled way one can distinguish between primary and secondary qualities: [1] because they are fused together in the acts of perception and cannot be taken apart; [2] as the pure indeterminate extension of the mathematicians it is an abstraction, yet all demonstrations and geometrical constructions require some sort of richer impression in the imagination; [3] because there is no idea in which we are not appetitively (evaluatively) invested in in some way or another; [4] there are perceptual differences across different levels of analysis. So he concludes:

> But, after all, there is no rational ground for that distinction, for surely an indifferent sensation is as truly a *sensation* as one more pleasing or painful, and consequently should not any more than they be supposed to exist in an unthinking subject.[319]

Simon Foucher's skepticism aimed against Descartes as related by Pierre Bayle in the article on Pyrrho goes like this: "For if the objects of our ſenſes appear coloured, hot, cold, and emit an odour, though they really are not ſo, why might they not appear to have extenſion and figure; at reſt and in motion, though they ſhould really be no ſuch thing? ... It is no leſs difficult for a Carteſian to ſuſpend his judgment with regard to the exiſtence of extenſion, than for a

[318] *Ibid.,* I: 62.

[319] *First Dialogue*, p.33.

peaſant to forbear affirming that the ſun ſhines, ſnow is white &c."[320] Leibniz said that "even extension has something phenomenal in it like colors etc." Or, writing to Arnauld on April 30, 1687, on account of the continuous nature of primary qualities: "the extensions we attribute to bodies are merely phenomena and abstraction" (*Philosophical Essays*, p. 87).

The indistinguishability of primary and secondary qualities and their relativity discussed subsequently in the *Dialogues* (p. 35) provide the grounds for Berkeley's crucial claim against corpuscularian realism with regard to primary qualities, namely, that the same arguments against the reality of secondary qualities may apply equally to primary qualities. The old line for mind-dependence placed around utterly private and first-personal affections such as pains and pleasures, being extended to other qualities that were found evaluatively or emotively non-neutral. In short, Berkeley's startling claim is that extension is an accident as immediate and inseparable from its being perceived as an instance of pain is.

> It seems there can be no perception—no idea—without Will, seeing there are no ideas so indifferent but one had rather have them than annihilation, or annihilation than them. ... there being no ideas perfectly void of all pain & uneasiness ...[321]

In fact, Berkeley seems willing to relativize the world to such a degree that all possible objects of perception would be as privatized as pains.

> From what hath been premis'd, it is a manifeſt Conſequence, that a Man Born Blind, being made to ſee, wou'd at firſt, have no *Idea* of Diſtance by Sight. The Sun and Stars, the remoteſt Objects as well as the nearer, wou'd all ſeem to be in his Eye, or rather in his Mind. The Objects intromitted by sight wou'd ſeem to him (as in truth they are) no other than a new Set of Thoughts or Senſations, each whereof is as near to him as the Perceptions of Pain or Pleaſure, or the moſt inward Paſſions of his Soul.[322]

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[320] Pierre Bayle, *A General Dictionary Historical and Critical* (London, 1739), VIII: 596b-597a.

[321] *Commonplace Book*, in *The Works of George Berkeley*, I: 53.

[322] *Essay Toward a New Theory of Vision*, §41, p. 44.

It would be no less absurd, for Berkeley, to claim there is some subsistent part of space, than to claim there's a pain somewhere in the room,[323] without someone admitting being subjected to it, as Mrs. Gradgrind, from C. Dickens's *Hard times*, could not do from her deathbed.[324] So, an infant is prone to think the burning sensation is in the fire, perhaps so that it can best avoid it, before the reasoning faculties are in place, just as Mrs. Gradgrind does, when her faculties are actually out of place.

[323] 'I think there's a pain somewhere in the room,' said Mrs. Gradgrind, 'but I couldn't positively say that I have got it' (*Hard times: For These Times* [London: Bradbury & Evans, 1854], Book II, Ch. 9).

[324] I rely on a illustration from literature offered by Roger Scruton in his introduction to Immanuel Kant.

IV.9 As sense, so language

Descartes confessed to a "natural inclination" [*impetus naturales*, *Med*. (1641), p. 38] that compelled him to refer sensible qualities to the objects that occasion them to our senses; and explained our seemingly deceiving faculties by reinventing their purpose: they were meant to be practically meaningful, as opposed to theoretically meaningful. Originally meant for the preservation of our unities of mind and body, that uncritical realism was deeply-rooted in the intuitions drawn from a more innocent age and further consolidated by habit and discourse; the statement 'fire is hot,' though clear in itself, is desperately confused and whatever truth can be salvaged from it it must be resolved into two primitively clear subjects, i.e. the two real attributes. Berkeley, on the other hand, thought that the objects of immediate perception, i.e. sensible ideas, and their combinations, are all given to the mind naturally fused and inseparable.

For Descartes, the source of error of the preceding worldview is a failure to understand the admonitory function of *sensus* as opposed to *intellectus*; that is, a division of labour between a faculty that reports the pragmatic truth of an environment (89)—the degree to which it is beneficial or harmful for the composite that makes a part of—and the faculty of *intellectus* that is assigned with reporting theoretical truths. For Berkeley, it is rather the failure to acknowledge that the proper function of language is *convenience* instead of *speculation* [325]and *admonition* instead of *communication*,[326] as both Descartes and Locke thought, no matter how much it facilitates communication in the long run.

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[325] "[W]ords which were framed by the vulgar merely for convenience and dispatch in the common actions of life, without any regard to speculation (cf. *Dialogues*, 94)."

[326] "… the raising of some passion, the exciting to, or deterring from an action, the putting the mind in some particular dispotition (*Principles*, Intro §20)"

So, the linguistic sign for ‘fear,’ or related fearsome circumstances just like the visual cue for fear, does not speak to the need of an abstract notion of fear, which would be practically useless, but rather the need to revisit a reaction similar to the ones excited over particular fearful circumstances in the past, or perhaps in the same way the mere sound of a profane word raises our aversion.

Ultimately then, the problem with the statement ‘fire is hot’ is not that it is fused, but that it is *not fused enough*: that, in its philosophical rather than the common understanding, the subject ‘fire’ is detached from the set of the ideas it is being perceived by. But to separate ‘fire’ from all those objects of immediate perception is no less impossible than separating the *cogito* from the *sum*.

IV.10 Conclusion: What Remains of the Concrete?

Descartes had been looking for forms of absolute certainty within the dream hypothesis, independently from there being a mind-independent world to settle their reality. This is why Descartes, famously, begins from certainty in disciplines that "care not about whether these objects exist or not" and attempts to imagine how the world might be like, in itself, if these disciplines could render known all there is to nature. Since these are understood as the real colors on which both to imaginary and real things are painted on [*ex quibus tanquam coloribus veris omnes istae, ... rerum imagines effinguntur*]—i.e. independently of whether the things they compose subsist or not—*their restoration gets us as far back into reality as that mind-dependent stuff that both dreams and waking lives are made on*. The only means we have to check the reality of our situation is to focus on the consistency of the dream itself.

Even though there is interpolated an order of liveliness, vividness and distinctness amongst the particular objects of sense perception from those put together in imagination or found in memory (AT VII: 75), the dream argument had shown there are no sufficient markers [*indicia*] to distinguish dream from reality. If the natural world is to subsist, it is not in terms of an inaccessible *substratum*, but as an *order* of natures that stands prior to our getting to knowing it and holds true despite our willing it or not. Ultimately, there is simply no need to suppose a material substrate for the order to be seen as real any more than there is for mathematical essences to be valid.

This is exactly where the *Meditationes* left us in the end of the sixth meditation, when it is affirmed that the well-sought-after mark [*indicium*] to tell dream from reality is actually the connection of a given stretch of experience with the continuum of our lives [*absque ulla inter-*

ruptione cum tota reliqua vita connecto (AT VII 90)]. The worldly natural sciences differ from the abstract sciences, not because the causes constitutionally lie hidden from us, like the substantial forms and their occult virtues, but because there is an order in the experience of the physical world that no finite creature could personally impose on others, or be able to sustain alone. And this was indeed the real answer to the Dream Argument offered in the beginning of the *Meditationes*: the world of waking experience observes certain regularities in the absence of which one can find the treasured *indicio distinguendi vigiliam a somno*.[327]

This comes with the realization that *what ultimately settles the truth and falsity of anything presented to the mind cannot be made of a stuff radically different than or independent of thought*, something standing unthought on the other side of our perceptual reach. The world makes itself known as an order and sequence of the immediate objects of perception. A *scientia* that, instead of relying on the strict but inscrutable logical necessity of attributes and the natures of the supposed subjects, would rely on the validation in variable experience of constancies described by invariable laws; or as Bishop George Berkeley would claim in his *immaterialist* hypothesis: "... explaining the various *phaenomena*, which explication consists only in shewing the conformity, any particular phenomenon hath to the general laws of nature, or which is the same thing, in discovering the *uniformity*, there is in the production of natural effects" (*Treatise*, I.62). As long as the will of different subjects is frustrated externally by sensations in a lawful way, they can converge into public objects of the external world.

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[327] "… ſi quis, dum vigilo, mihi derepente appareret, ſtatimque poſtea diſpareret, ut fit in ſomnis, ita ſcilicet ut nec unde veniſſet, nec quo abiret, viderem, non immerito spectrum potius, aut phantaſma in cerebro meo effictum, quàm verum hominem esse judicarem. Cùm verò eæ res occurrunt, quas diſtincte, unde, ubi, & quando mihi adveniant, adverto, earumque perceptionem abſque ullâ interruptione cum totâ reliquâ vitâ connecto, plane certus ſum, non in ſomnis, ſed vigilanti occurrere (AT VII 89-90)."

CONCLUSION: FROM SEAL, TO PRESS, TO SIGN

> Neither are all theſe whereof we have ſpoken, and others of like nature *meer Similitudes* only, as men of narrow obſervation perchance may conceive; but one & the very ſame footſteps, and ſeals of Nature, printed upon ſeveral ſubjects or matters. [328]

The purpose of this dissertation had been to trace the development of the concept of matter from its High Medieval origins, to the Cartesian turn, with Berkeley's *immaterialism* set as its closing act. I hope that, by now, these four chapters in sequence have sufficiently exemplified the opening analogy of a theater of metaphysics: that the functions of a more-or-less persisting metaphysical framework could be served by different parts or aspects of reality—just as the roles in a play can be constantly recast with different actors, or even have one of its parts grow irrelevant.

Needless to say, there were many 'plot-shifts' intervening between Thomas to Descartes and Descartes to Berkeley that were either left unaccounted for or merely bracketed on a high level of abstraction. What we did cover in detail however was: (a) the different manners divine benevolence was cashed out among Thomas, Descartes, and Berkeley; (b) different theological anthropologies at play determining the boundaries in each case between world and self, and those between matter and thought. Finally, we noticed (c) a general surge of epistemic optimism: the view that the world can be such that we have absolute knowledge of, if only through the order and the relations we ourselves project onto it, instead of a world whose causal depths are

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[328] Francis Bacon, *Of The Advancement and Proficience of Learning, or the Partitions of Sciences*, IX Books, trans. Gilbert Wats (London: Golden Ball, 1674) Lib. III, p. 85-86.

hidden away from our corrupted sense.

Still, we can affirm Descartes occupied a rather sophisticated intermediate position between the pre-modern duck and the post-Cartesian rabbit. In fact, there are moments where Descartes uses elements of the old discourse to draw new distinctions in *rerum natura* with concomitant new epistemic possibilities—i.e. the doctrine of ideas, the power of intuitive perception, the pure object of a higher-level *mathēsis*. But there are also a few moments we find him picking up traditional objects but framing them within a different conceptual ecosystem—i.e. human intellect and angelic intelligence.

Chapter I found Thomas thinking an entity's 'concentration in matter' made possible a continuum of perfection—from prime matter to stone, from plant to animal, and from man to angels of varying degrees of purity, finally to the First Act; as it also made possible, by correspondence, a continuum of cognitive power—from plant and mollusc, degree zero of cognition, to the divine mind that can find in its essence ideas of everything there is.

Chapter II elaborated on how the materiality of a given subject matter also determined the degree to which that discipline lends itself to exact and certain knowledge. The more the affections under study were said 'like the snub' [*sicut simum*] the more their proximate matters were involved in their explanations [*καθ' ὑποκειμένου*]. As applied in the theory of science then, matter suggested a continuum of ascending certainty (*ἀκριβολογία*; *exactitudo*, or *certitudo*) among scientific disciplines. As interpreted and argued for in the *De certitudine mathematicarum disciplinarum* (1547) by Alessandro Piccolomini, the realization that physical sciences dealt with enmattered attributes whose causal grounds lie hidden "in the obscure heart of nature" had set low expectations for the extent and the evidential value of man's knowledge of the natural world in

the present life.

Coming in sharp contrast with this epistemic pessimism endemic to Peripatetic circles, Descartes (Chapter III) offered a new vision for a general framework of knowing [*mathēsis pura* and *universalis*] that affirmed the same degree of certainty in all disciplines regardless their alleged concentration in matter. What remained of the old world, once we divest it from the confused ideas of sense, the unseen virtues of substantial forms and the obscure notion of prime matter, is an indefinite corporeal nature that exists in the world exactly as it exists in the geometer's imagination. As a matter of fact, we described Descartes's meditator as an "epistemic Adam" or a glorified human being in his ability to: (i) reflect on the complete nature and the existence of his own self in isolation of any sensible input; (ii) insofar as his intellect came with its own innate objects of intuition that are not gleaned from sensible things (ego, being, God, corporeal nature); (iii) to the degree he could use these primary intuitables (the *veritates æternæ* and the *naturæ simplices* of the *Regulæ*, or *maxima generalia* of the *Med*.) to, as it were, triangulate the nature of particular bodies, almost like Adam did or angels were speculated to do so by Thomas through a *divine influx* of intelligible species.

Finally, many iterations later towards this 'spiritualization of the world,' Berkeley (Chapter IV) found that original notion of a material *substratum* to have receded further away from our grasp, towards the vanishing point of any possible characterization. According to him, the endless disputes about the boundaries of the self and the world, the mind and matter, should be dropped in the name of an all inclusive mode of existence in two *voces*: thinking and being thought, *percipere* et *percipi*.

So, while Descartes, in contrast to Piccolomini, adopted the intuitive certainty of mathe-

matics as a guarantee of truth (if not of *ipso facto* existence), Berkeley subverted the whole project by refusing any reality to mathematical or physical models as such, looking at them as serviceable *phantomes* or fictions. Ultimately, Berkeley promotes a view in which all ideas, sensorial and intellectual, are natural signs, and their correspondence to a waking world as opposed to a dreamed-up one is adjudicated on the basis of an intrinsic criterion of vividness and lawful sequence.

At this point, it might be useful to attempt one last take on these episodes in the history of ideas, this time by following the models used in analogy to explicate the nature of cognition.

(Fig. 4) Cylinder seal and modern impression. ca. 1820–1730 B.C. Accession Number- 1991.368.5 The Metropolitan Museum of Art, Fifth Avenue, NY.

Setting aside the deduction of a *ὑποκείμενον* from the nature of change—elemental in the *De Generatione et Corruptione*, or substantial and accidental in the *Physica and the Metaphysica*—the most palpable and popular notion of matter came from the *De Anima*, the passage we quoted in the beginning as one of the three major *topoi* in the Aristotelian corpus (*De Anima* II, 424 a17-19 and III.9 432 a1-2). In the analogy that would be cited on hundreds occasions across the centuries after Aristotle, matter was related to cognitive power as an iron seal relates to a piece of wax. The seal impresses its sigil on wax or clay (fig. 4) but not also the iron it is cast in, much less the hand applying the necessary force. In that sense, *ὕλη* becomes a byproduct of abstraction—physical or intellectual—in any possible perceptive act; as that part of reality that does not enter and cannot ever enter the sensory or intellectual faculties. Nevertheless, there is a formal continuity of the sigil across the two media, iron or wax, such that the impression taken on by the wax implies the use of a particular stamp, say the king's official one, as its source and

its archetype.

In analogy to that seal's figure, texture and meaning, the sensible species, or semblances, were expected to emanate from substances, be transmitted across the environing media, and imprinted in the perceiver. As such, they were supposed to be the fundamental links between world —mundane and supramundane—and mind—including the linking of the mind with its own acts of understanding. So, referring the same quality found in the *anima* to a world *extra animam* relied on the formal unity of that quality as an accidental form across all *substrata* mediating between source and target.

If, however, all attributes in nature were said "like the snub," [*omnia sicut simitas*]—as Aristotle, Thomas and Piccolomini certainly believed—that crucial direct realism in regards to the qualities of any natural 'seal' would be restricted to mere surface phenomena. In contrast to the sigil getting transferred across the two matters, such essences would be incommunicable in principle, like the iron it is made of or the wooden handle it is attached to. That is simply because such essences command a particular and proper *substratum*, just as the 'snub' implies 'noses.' And in an apodictic environment, they ought to be proved of these *substrata* as their *per se* attributes.

What is more, the theo-epistemic framework of Thomas which was still alive in Renaissance Italy before Galileo, Bacon and Descartes, took the natural world to be created such that, given sufficient cognitive power, all effects could be traced back into their proper causal grounds. The absolute nature of fire had been made such that God could read off all the sensible qualities that emanate outward; for Him: 'fire is hot' can be known as certainly and as absolutely

as a triangle can be known to have an internal sum equal to two right angles.[329]As a matter of fact, in terms of the ongoing analogy, it would be possible to deduce just by looking at the impressed sign the stuff the stamp was cast in, the exact shape of its handle, or even the hand and the intentions of the official using it.

This was the very link that would be undermined by Early Modern corpuscularianism (as it was once also undermined by ancient and hellenistic variants of atomism). Qualities once thought proper to the concrete entity acting as their proximate matter, now immediately resided in the mind. The distinction between primary qualities that pertain to the subject of the world *formaliter* and the secondary qualities that pertain to the subject of the experimenter *spiritualiter* or *objective* became the marks of a much deeper distinction between their proximate subjects. This asymmetry between physical states and internal conscious states, was to reveal, in Descartes, a more fundamental asymmetry between the world and the experiencer, a *distinctio realis*.

Since the preceding Peripatetic model of perception and of knowledge was empiricist at heart, those sensible species were fundamental for the formation of concepts and the formulation of true judgments about the world. They also 'painted' the mind in a way that its operation could become apparent to itself, as explored earlier. Without a mental image the human mind cannot think anything at all, much less contemplate its own essence. Thus, to claim there is no formal continuity between the properties of the world and their collective impression over the sense or-

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[329] "Whosoever then versed in the nature of reality [*in natura rerum eruditus*], gets to know that final difference that alone is in act (Ar. *Met*. VII) or proper substantial form of some subject, he will be able to use it for deducing the passions [*vltimam illam differentiam, quæ sola actu est, ... seu propriam formam substantialem alicuius subiecti, cognouerit, hac ad concludendas passiones vti poterit*]. That is because, as they say, the passions flow from the forms in a certain order, and they are found in a subject [*certo ordine a formis passiones fluunt, & in subiecto reperiuntur*] (Piccolomini, *De Certitudine*, Ch. XI). Cf. Locke also retains this standard of scientific knowledge about his *real essences* even though he is pessimistic of ever attaining it.

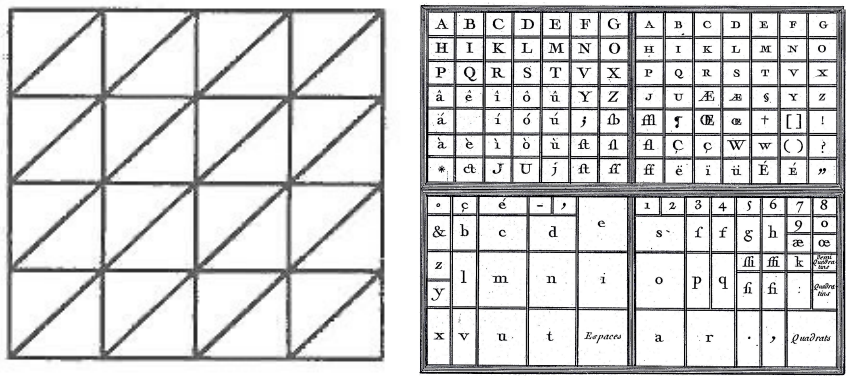
gans is really to undercut the realistic foundation of Peripatetic empiricism. Any relation of resemblance or likeness between the soul and the world of sense, so crucial as it was for the mind's *turning* (*convertendo ad res*) towards the external world would no longer hold.

Absolved from the duty to trace a *fons emanationis* into the material world, the corpuscularian was free to imagine geometrical relations between states, powers, effects in a manner that had previously only been available in the study of celestial bodies and their degrees of freedom in motion. Celestial bodies—just as Democritean, Epicurean or Gassendian atoms—were potential only in regards to the location, speed, and disposition they may potentially take on. So they were said to contain matter only insofar as these eventualities are concerned [*ὕλη κινητή*]. And all ought to be studied *sicut eclipsis*.

In his early *Regulæ*, Descartes actually extended the old wax analogy by claiming that *all* kinds of stimuli must be accounted for through the dispositional changes that can be both felt and seen. Even at the level of a system of encoding, this was a subtle attack to the intentional or spiritual existence of forms we described in Chapter I. For it is clear that if any sensible thing, insofar as it may be sensed, can only affect the figure and disposition of the sensible organs, there can be no in-between twilight state between the manner the substantial form of fire informs this lot of air (*naturaliter*), the light and color it emits across the transparent medium (*spiritualiter*) and the intention introduced in the sensitive soul (*intentionale*). It is the very capacity of two-dimensional shapes to encode so many sensible differences by as many differences of disposition, that allows Descartes to actually claim a literal use of the wax model of perception[330] in the *Regulæ*. In that view, all kinds of stimuli should affect a unique change in the *commonly sensible* properties

[330] "… Neque hoc per analogiam dici putandum eſt" (*Regula* XII, AT IX 412].

of the organs of sensation just as an external shape leaves a distinct mark on the wax.[331] In his proposal to codify these changes by an equally varying lot of possible two-dimensional shapes—the infinite multiplicity of figures being "sufficient for the expression of all the differences in perceptible things,"[332] it is as if Descartes modernizes the ancient stamping analogy with the analogy of the movable-type printing press (fig. 5-6).



(Left, fig. 5) Descartes's example for mapping color differences onto two dimensional shapes (Regula XII, AT X: 413).
(Right, fig. 6) Engraving of a printer's typecase by Robert Bénard after Louis-Jacques Goussier.

To evoke this deep asymmetry between the world as it is in itself (in this case the printing press) and the ideas incited in us (a given content encoded into a printed volume) Descartes often relied on familiar cases of *semiosis* from everyday life. In his *Le Monde*, signs are found related to meanings by human convention or by a fiat of nature—in the way a particular paroxysm of the face can be an arbitrary sign of an inner state of happiness. And just as an Arts student of the time might have internalized the meaning of a lecture without any definitive recollection of the language it was originally delivered in, we may as well wonder at the very least, whether our experience of the world is built on another system of natural signs, even if we are often unaware of

331 "Figuram externam corporis ſentientis realiter mutari ab objecto, ſicut illa, quæ eſt in ſuperficie ceræ, mutatur à ſigillo" (*Ibid*., 412).

332 *Regula* XII: "figurarum infinitam multitudinem omnibus rerum ſenſibilium differentijs exprimendis" (AT X: 414, CSM I: 41).

it. If sensations of pain or sound bear no resemblance to their proximate causes, what precludes us from conceiving all sensible reality in that manner?

By the time we reach the *Discours* and the *Meditationes*, the distinction between the simple natures of intellectual and corporeal things we find in the *Regulæ*, i.e. their distinction as classes of ideas in their objective being, meets good metaphysical reasons for being matched by a real distinction in the world itself, one substance subsisting outside the other.

By then however, it is clear that the wax model had exceeded its use, together with any remaining sense of quality-realism it was associated with. The model (A) would no longer account for the objects of sense, since there was no conformity between them and the world any more than there is between the pain and the weapon that inflicts it; (B) and neither could it account for the intuitable elements of our thought—ideas of self, of God, of simple natures and eternal truths—because these were not *impressions*; they could have never been acquired physically, through either external or internal sense.

Still, a world that subsisted in a nature so different from our sensorial outlook must affirm some value, lest it be the sign of a mass deception. If not truth value, the sensible make-up of the world could assume practical significance as a system of warnings, not truths. In the *Discours* and the *Meditationes* there is a division of labor established between *sensus*, which reports the degree to which a particular environment is beneficial or harmful for the composite human being; and *intellectus* that is assigned with reporting theoretical truths. Here we note a great shift in how God's benevolence was supposed to be expressed in the human condition. If the God of Descartes, just as the God of Malebranche, of Locke, and Berkeley, had created the sensible world such that one may survive in it, the impressions incited in us must form an arbitrary order

of practically meaningful natural signs. External reality is allowed to exist in a way that does not exactly correspond to our sensory grasp of it, without making us victims of deception, so far as *sensus* is repurposed for a different end than to report the truth of things in the context o theoretical philosophy.

Likewise, proving the existence of an external world in all metaphysical certainty did not seem so integral to the followers of Descartes for the preservation and perpetual flourishing of human life, any more than the Copernican hypothesis was integral for all the intents of practical life. If indeed the world is primarily made to be navigated and survived through, rather than to be understood, and the knowledge of its true nature bears no practical meaning, its existence might as well fall outside natural reason. In other words, the non-existence of the world would not betray God's truthful nature. As long as body, so far as it can be sensed, serves a different philosophical goal than to be the potential object of theoretical philosophy, God is excused for not bequeathing man with the means to demonstrate the existence of matter.Overall then, it seems that the hope that the existence of the external world could be demonstrated by the help of the *lumen naturale* was diminished in proportion to how many real-world qualities were reinterpreted as signs for our navigation in the real world, assimilating what once was an object of theoretical study to an object of practical philosophy, an ethics attuned to a specific form of good.

What is left of the original wax metaphor is simply its bare semantic function: the qualities that make up the world are not like the semblance of a king's sigil impressed upon the faculty of sense. Instead, sensible appearances are related to the world as the appearance of the king's seal on a document is related to the invisible *meaning* or *authority* it conveys. Here is a graphic element arbitrarily imposed and maintained by the king's power, by means of which we can tell

an authentic document from a fraudulent one, just as a lawful procession of sensible ideas imposed and maintained by divine fiat, so that we may tell the beneficial to the detrimental, or dream from reality.

In Berkeley's conclusion, the perennial metaphor of the *Liber Naturæ* and Francis Bacon's metaphor of an *interpretatio* of Nature, find their ultimate expression. What becomes of the objective of scientific inquiry is discovering the language that the book of nature is written in and mastering the grammar and syntax it is articulated by. We may call an immaterialist natural philosopher a sort of 'natural philologue.' So, concerning the same fire countenanced by Descartes's meditator in the pre-theoretical stage, such a philologue would say that fire is merely a sign that brings a series of distinct yet interconnected ideas of sense under the arbitrary unity of a sign. For the immaterialist, an actual fire is in reality a combination of sensible ideas that are excited in us by an all-powerful and ubiquitous intelligent cause in a strong, orderly, reliable fashion so that they can abbreviated together by the name 'fire';[333] To say {fire is hot} is just to explicate the meaning of the word 'fire,' it being nothing distinct than all the accidents that compose it. As Berkeley puts it: "The Fire which I ſee, is not the Cauſe of the Pain I suffer upon my approaching it, but the Mark that forewarns me of it."[334] So the objects of our perception are found united in recurrent combinations as 'natural abbreviations' meant to admonish (and raise wonder), not to inform the understanding.Ultimately, this means there is no more hope in finding an explanation of why 'fire is hot' than in finding an explanation as to why an arbitrary sign, the word "fire" itself, is connected with what it signifies. With this, the epistemic goal of deducing one from another became no less unattainable, than to deduce the form of an animal from the

[333] *Principles*, §49, cf. Caesar example on *Three dialogues*. I, pp. 45-46.

[334] *Principles*, §65.

name chosen by Adam for it, or, say, deduce the notion of heat from the Greek word *θερμόν*.

And thus, the printing-press model, superseding the seal-and-wax model, is ultimately replaced by a linguistic paradigm. The mental world is to the actual world, not as wax was to the seal, but as an ordered system of signs is arbitrarily linked to a nexus of meanings. Though such a system reliably observes certain discoverable rules of grammar and syntax, i.e. the natural laws, there is no necessary connection to the sequence of meanings, any more than there has been a connection of all these letters and sentences comprising this study to the thoughts they were meant to invoke in the mind of the reader.

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