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Special Issue: Theories of Mixture in the Early Modern Period

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CONTENTS

ARTICLES

REVIEW ARTICLE

BOOK REVIEWS

ARTICLES

JEMS 4 (2015), 1: 9–27

Mixtures, Material Substances and Corpuscles in the Early Modern Aristotelian-Thomistic tradition: The case of Francisco Soares Lusitano (1605–1659)

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Abstract: This paper analyzes the theory of mixtures, material substances and corpuscles put forward by the Portuguese Thomistic philosopher Francisco Soares Lusitano. It has been argued that the incapacity of the Aristotelian-Thomistic tradition to reconcile an Aristotelian theory of mixtures with hylomorphism opened the way to the triumph of atomism in the seventeenth century. By analyzing Soares Lusitano's theory of mixtures, this paper aims to demonstrate that early modern Thomism not only rendered the Aristotelian notion of elements compatible with the metaphysical bases of hylomorphism, but further incorporated an explanation of physical phenomena based upon the notion that bodies were basically made up of small and subtle corpuscles. By doing so, it shows that, contrary to what is so often claimed, early modern corpuscularism was not intrinsically incompatible with late Aristotelian philosophy.

Keywords: *Theory of mixtures; Corpuscularianism; Early Modern Aristotelianism; Thomism; Francisco Soares Lusitano, Conimbricenses*

1. Introduction

While analyzing the Thomistic treatment of the structure of material substances and particularly the highly controversial relationship that was perceived to exist between the Aristotelian conception of elements and the metaphysics of form and matter, Anneliese Maier argued that the answer given by Thomas Aquinas and the Thomistic tradition paved the way to theories that ultimately

put in question the proper existence for elements as the ultimate components of the physical world. From Maier's point of view, the Thomist incapacity to put forward a suitable solution to such a philosophical problem contributed to the emergence of theories that either reduced elements to mere representational simulacra of the smallest units of the physical world (Duns Scotus) or simply eliminated them as the fundamental constituents of physical reality (Jean Buridan).[1] By doing so, in the domain of the physical structure of reality, Thomistic tradition led to a sort of philosophical cul-de-sac. It stretched out the tension between Aristotelian physical and metaphysical understandings without further succeeding in finding a solution to it. In fact, as Maier stated in her comprehensive essay "Die Struktur der materiellen Substanz," published for the first time in 1943, "Scholastic philosophy failed to solve the problem because it was not soluble for it. The concept of the structure of the physical world formed out of elements (…) is incompatible with the fundamental principles of Scholastic metaphysics."[2] This failure would later open the way to the triumph of atomism in the seventeenth century.

Based upon such an understanding, although not necessarily referring to Maier, the traditional narrative of the so-called Scientific Revolution has taken corpuscularism as one of the chief touchstones to distinguish between the seventeenth-century *nova scientia* and that of the Last Scholastics (to use an expression by Roger Ariew[3]). The general view is that corpuscularism, a major characteristic of the chemical and mechanical philosophy, was instrumental in the replacement of late Aristotelianism. In this philosophical dispute, a special role was reserved for the theory of mixtures, as it was allegedly the domain in which authors first ceased to try to reconcile hylomorphism with Aristotelian theories of matter and, in its place, started to endorse corpuscular matter theories inspired by ancient atomism. This was the view, for example, of E. J. Dijksterhuis, who attributed a seminal role in this process to the "chemists" of the sixteenth century. As the author of *The Mechanization of the World Picture* claimed, "they [the chemists who rejected the Aristotelian form concept as an explanatory principle for the study of composite substances] (…) did their best, after having explicitly declared against Aristotle that a compound is no more than an aggregate, to find in the corpuscular theories themselves the means for explaining that it is something more after all. These means had been

[1] Anneliese Maier, "Die Struktur der materiellen Substanz," in *An der Grenze von Scholastik und Naturwissenschaft*, 2nd ed., Rome: Edizioni di Storia e Letteratura, 1952, pp. 1–140, especially at pp. 137–138.

[2] "Die Scholastik hat das Problem nicht gelöst, weil es für sie nicht lösbar was. Der Gedanke eines Aufbaus der physischen Welt aus den Elementen ist (...) nicht vereinbar mit fundamentalen Prinzipen der scholastischen Metaphysik." Maier, "Die Struktur der materiellen Substanz," p. 138.

[3] Roger Ariew, *Descartes and the Last Scholastics*, Ithaca: Cornell University Press, 1999.

ready to hand ever since Democritus."[4] In the early seventeenth century, this path was followed by the proponents of the new physical theories. Despite their internal differences, *novatores* such as Descartes, Gassendi and Huygens agree in explaining natural phenomena by means of the shape, size, quantity or motion of small atoms or corpuscles. By the beginning of the eighteenth century, there was no room for a convincing scientific explanation of matter in terms of the Aristotelian theory of matter and form.

Nevertheless, scholars such as William Newman have recently provided sound evidence that early modern Aristotelian philosophers elaborated upon an alchemical tradition, whose roots lay in Gerber's *Summa perfectionis*, in order to integrate corpuscularian theories within an Aristotelian framework.[5] Daniel Sennert is a case in point. Sennert developed an alchemical experimental theory based upon the notion that atoms were the fundamental material causes of physical bodies. And yet, he did not discard the Aristotelian theory of substantial forms.[6] By focusing on the case of Honoré Fabri, Dennis Des Chene has furthermore demonstrated that the capacity to reconcile corpuscularian theories with the Aristotelian metaphysics was not exclusive to alchemical Aristotelians.[7]

This paper is aimed at further developing this argument by demonstrating that, contrary to Maier's assumption, early modern Thomist authors worked out a philosophical solution that not only rendered the Aristotelian notion of elements compatible with the metaphysical bases of hylomorphism, but further incorporated an explanation of physical phenomena based upon the notion that bodies were basically made up of small and subtle particles or corpuscles. This paper will focus on the case of the Portuguese Jesuit philosopher Francisco Soares (1605–1659). Thomistic tradition was very well rooted in early modern Portugal. As a consequence of the country's engagement in the Counter-Reformation, a political and cultural movement intensified by King João III (John III) (1502–1557), Jesuits had virtually a monopoly of university teaching of philosophy in Portugal. They controlled the College of Arts, which prepared the students who then enrolled in the higher faculties of the

[4] E.J. Dijksterhuis, *The Mechanization of the World Picture*, trans. by C. Dikshoorn, Princeton NJ, Princeton University Press, 1986, p. 283.

[5] For example, William R. Newman, *Atoms and Alchemy. Chymistry and the Experimental Origins of the Scientific Revolution*, Chicago: Chicago University Press, 2006.

[6] Emily Michael, "Sennert's sea change: atoms and causes," in Christoph Lüthy, John E. Murdoch and William R. Newman (eds.), *Late Medieval and Early Modern Corpuscular Matter Theories*, Leiden: Brill, 2001; pp. 331–362; William R. Newman, "Experimental Corpuscular Theory in Aristotelian Alchemy: From Geber to Sennert," in C. Lüthy, J.E. Murdoch and W.R. Newman (eds.), *Late Medieval and Early Modern Corpuscular Matter Theories*, pp. 291–329; Newman, *Atoms and Alchemy*, pp. 85–153.

[7] Dennis Des Chene, "Wine and water: Honoré Fabri on mixtures," in C. Lüthy, J.E. Murdoch, W.R. Newman (eds.), *Late Medieval and Early Modern Corpuscular Matter Theories*, pp. 363–379.

University of Coimbra, from the 1540s, and they ruled their own university in Évora, a university established in 1559.[8] In this educational enterprise, a special role was reserved for the elaboration of a comprehensive commentary on the Aristotelian philosophical *corpus*. After a long period of composition, the multi-volume textbook was published in the 1590s (and 1600s) under the generic title of *Commentarii Collegii Conimbricensis*.[9] This textbook exerted a profound impact on generations of European scholars during the first decades of the seventeenth century.[10]

While analyzing the early modern natural philosophy elaborated in the Portuguese context, historians tend to focus almost exclusively on the *Conimbricenses*.[11] Charles B. Schmitt, who contributed most to the study of the *Conimbricenses* in the European context of the Renaissance revitalization of Aristotle,[12] asserted, for example, that "after the immense success of the *Cursus conimbricensis*, which served many generations of students between the 1590s and the 1630s, Portugal fell into the background while Spain remained a bastion of Jesuit education."[13] Although it is certainly indisputable that there was no work by a seventeenth-century Portuguese philosopher with an influence comparable to that achieved by the *Cursus Conimbricensis* (or even by Arriaga and Oviedo),

[8] Luís Miguel Carolino and Henrique Leitão, "Natural Philosophy and Mathematics in Portuguese Universities, 1550–1650," in Mordechai Feingold and Víctor Navarro Brotons (eds.), *Universities and Science in the Early Modern Period***,** Dordrecht: Springer, 2006, pp. 153–168. For a broad historical account of the universities of Coimbra and Évora, see Mário Brandão and M. Lopes de Almeida*, A Universidade de Coimbra. Esboço da sua História*, Coimbra: Universidade de Coimbra, 1937; *História da Universidade em Portugal.* 1 vol., tom. II: 1537-1771, Lisbon: Fundação Calouste Gulbenkian, 1997; Sara Marques Pereira and Francisco Lourenço Vaz (eds.), *Universidade de Évora (1559-2009)*, Lisbon: Chiado Editora, 2009; José Maria de Queirós Veloso*, A Universidade de Évora. Elementos para a sua História*, Lisbon: Academia Portuguesa de História, 1949.

[9] On the elaboration process of the Coimbran commentaries, see particularly Cristiano Casalini, *Aristotele a Coimbra. Il "Cursus Conimbricensis" e l'Educazione nel "Collegium Artium*," Rome: Anicia, 2012 and Pinharanda Gomes, *Os Conimbricenses*, Lisbon: Instituto de Cultura e Língua Portuguesa, 1992.

[10] In Portugal, its influence was so overwhelming that it was common throughout the seventeenth century to entitle the manuscript lecture notes produced outside the University of Coimbra (in this case, at the University of Évora) *Compendium* or *Commentarium Conimbricensis*.

[11] The same is valid for the Portuguese-speaking historiography — see, for example, Pedro Calafate (ed.), *História do Pensamento Filosófico Português*, vol. II: *Renascimento e Contra-Reforma*, Lisbon: Editorial Caminho, 2001. Neverthless, there are important exceptions such as W.G.L. Randles's "Le ciel chez les Jésuits espagnols e portugais (1590-1651)," in Luce Giard (dir.), *Les Jésuites à la Renaissance. Système éducatif et production du savoir*, Paris: Presses Universitaires de France, 1995, pp. 129-144 and *The Unmaking of the Medieval Christian Cosmos, 1500-1760. From Solid Heavens to Boundless Aether*, Aldershot: Ashgate, 1999.

[12] Particularly in Charles B. Schmitt, *Aristotle and the Renaissance*, Cambridge, Mass: Harvard University Press, 1983.

[13] Charles B. Schmitt, "Galilei and the Seventeenth-Century Text-Book Tradition," in *Reappraisals in Renaissance Thought*, London: Variorum Reprints, 1989, p. 223.

an inspection of the philosophical theories of authors such as Francisco Soares illustrates the vitality and intellectual richness of early-modern Aristotelianism taught at Portuguese universities by the mid seventeenth century.[14]

Francisco Soares, or Francisco Soares Lusitano as he was commonly known by his contemporaries in order to distinguish him from the Spanish Jesuit metaphysician Francisco Suarez, taught philosophy, in the late 1630s, at the Coimbran College of Arts. Then he moved to the University of Évora to teach theology.[15] In 1651, Francisco Soares Lusitano published his *Cursus Philosophicus*, a broad commentary on Aristotle that was intended to replace the Coimbran commentaries on the Aristotelian philosophy. Soares's *Cursus Philosophicus* would become strongly influential in Portugal and in the Portuguese-speaking world up until the end of the seventeenth century, being reissued until as late as 1701–03.

In the commentaries on Aristotle's *De Coelo* and, specifically, on that of *De Generatione et Corruptione*, Francisco Soares Lusitano put forward a corpuscularian concept of matter in the context of an Aristotelian metaphysical framework of matter and form. His analysis shows that Thomistic philosophers of the early modern period had a say in solving the *aporia* identified by Anneliese Maier in the relationship between Aristotelian matter theory and the metaphysics of hylomorphism. According to Francisco Soares, physical matter was formed by very small corpuscles provided with form (and matter), which under the influence of external causes, such as the influence of planets, could be further divided or join other elements, bringing about new

[14] For details of the dynamic and eclectic character of the early-modern Aristotelianism in general, see, among many others, Roger Ariew, *Descartes among the Scholastics*, Leiden: Brill, 2011; Edward Grant, "Aristotelianism and the Longevity of the Medieval World View," *History of Science* 16 (1978), pp. 93–106; Craig Martin, *Renaissance Meteorology. Pomponazzi to Descartes*, Baltimore: The Johns University Press, 2011 and Schmitt, *Aristotle and the Renaissance*.

[15] Francisco Soares Lusitano was born in 1605 in Torres Vedras. Having entered the Society of Jesus in February 1619, he made his studies of philosophy at the *Colégio das Artes* (College of Arts) in Coimbra between 1623 and 1627, and Theology at the College of Jesus (in Coimbra) between 1631 and 1635, before becoming a noted professor of philosophy, and above all, of theology. He first taught philosophy at the College of Arts (1636-1640), afterwards devoting himself to theology at the College of Jesus (1640-1654) and at the University of Évora (1654-1659), where he eventually became rector (1658-1659). Despite publishing his *Cursus Philosophicus* in 1651, which was very successful and widely read in Portugal and Brazil during the second half of the 17th century, his main area of interest seemed to be theology. Francisco Soares Lusitano dedicated most of his time as a teacher to this subject and had intentions of publishing an extensive work that would bring together all his theological writings. His philosophy course was, in a certain way, conceived as a kind of 'prologue' to his theological work. However, this objective was never in the end realized, because Soares Lusitano died in 1659, in Juromenha, in the Restoration Wars against Spain, having participated in the academic battalion of the University of Évora. The deepest study on Soares Lusitano's biography is still Francisco Rodrigues, "Um mártir da Restauração de 1640," *Trabalhos da Associação de Arqueólogos Portugueses* 6 (1942), pp. 53–73.

compounds. In Soares's natural philosophy, corpuscles played thus a key role whose understanding was crucial in order to explain natural processes. Yet, Soares's corpuscularianism is distinct either from the *mechanical corpuscularism*, which explained nature by means of the interaction, motion, size, shape and quantity of small atoms, or from the *alchemical corpuscularianism*, which took a mixture to be a bonding of elemental particles retaining their own identity in the compound, thus allowing them to be recaptured by means of laboratory processes. From Soares's point of view, the theory of the existence of small and thin corpuscles is entirely consistent with the Aristotelian conception of elements and the metaphysics of form and matter. In fact, as the following pages show, Soares's theory is a development of the Aristotelian philosophical framework, and particularly of the problems emerged within Aristotelian mixture theories. Accordingly, it was neither a reaction against nor an appropriation of theories advocated by the *novatores*, but a theoretical development that shows the vitality of the early-modern Aristotelianism.

2. Theory of mixtures in the Aristotelian-Thomistic context

The Aristotelian theory of mixtures included a wide range of phenomena that are not considered by modern chemistry. It covered not only chemical combinations, but also a large set of mixtures and changes including, for example, the appearance of frogs, under certain circumstances, from putrefying matter. In general terms, a mixed body was thought to be a physical reality made up of the four basic elements. According to the Thomistic standard definition, "a mixing is a uniting of altered mixables."[16] In the seventeenth century, Eustache de Saint-Paul (1573–1640), a French Cistercian whose *Summa Philosophiae Quadripartita* (Paris, 1609) Descartes took to be a typical Scholastic textbook in philosophy, built upon the Thomisic tradition to assert that a mixing is a "union of the mixable elements under a substantial form of a certain mixed body."[17] It is well known that Jesuits were prone to Thomism, being recommended by the *Constitutions* of the Society of Jesus to follow the doctrines of Thomas Aquinas in logic, natural philosophy, ethics and meta-

[16] *In Librum Primum De Generatione et Corruptione,* lect. 25, quoted in Joseph Bobik, *Aquinas on Matter and Form and the Elements. A translation and interpretation of the* 'De Principiis Naturae' *and the* 'De Mixtione Elementorum' *of St. Thomas Aquinas*, Notre Dame: University of Notre Dame Press, 1998, p. 274. Aquinas's *De Generatione* is an unfinished book. Book I, lect. 18 onwards was written by Thomas Sutton and others. Bobik, *Aquinas on Matter and Form and the Elements,* p. 172, n. 11.

[17] "Mixtionem hic accipimus non pro quavis rerum similium aut dissimilium coacervatione, sed pro *unione mixtilium elementorum sub una substantiali forma alicuius mixti*, corruptis mixtilium formis." Eustache de Saint-Paul, *Summa Philosophiae Quadripartita*, Paris: Apud Carolum Chastellain, 1609, Tertia pars, *De Elementis*, quaest. 12, p. 208.

physics.[18] Accordingly, it is no surprise to find the same understanding in the Coimbrans' *In duos libros De Generatione et Corruptione*, which guided Francisco Soares Lusitano's philosophical training on mixtures while a student at the College of Arts in the 1620s. *Conimbricenses* stated along a Thomistic line that a "mixture is a generation of a mixing from altered *mistilibus*."[19] Hence, in a mixture, the four elements are combined in such a way that they suffer an internal change and give rise to a compound body with a new form of being. The classical example was the case of wine, which was believed to be produced by mixing the correct amounts of water, earth and fire. Naturally, according to this notion, the amounts of the elements differ significantly according to the different concrete compound bodies that they bring about.[20] Francisco Soares Lusitano relied upon this Thomistic understanding of mixtures in order to put forward a corpuscuslarian conception of matter.

Chemical composition, from an Aristotelian-Thomistic point of view, is thus different from that proposed by atomist philosophers. In a mixture, it is no longer possible to isolate immutable particles, as the constituents are *unified* under a new form of being. This brings us to the topical question in Scholastic literature of whether the elements continue to exist in the mixtures. Although some authors answered this question affirmatively, according to Eustache de Saint-Paul, the most accepted position was the one that argued that elements did not remain in the compound bodies. In the act of mixing, the forms of elements were extinguished and elemental matter was taken under a new form. Thus, in a new mixture there was no room for a plurality of forms and different degrees of substantial forms. Therefore, as the French philosopher mentioned, the generality of philosophers agreed that in mixtures, "elements are present not *in actu* or actually, but virtually (*potestate*) and in accordance with the supplied qualities."[21] That is to say, despite the destruction of substantial forms of the simple bodies (elements), their qualities—i.e. heat, cold, wetness and dryness—were in some way preserved in the mixed bodies.

[18] Ignatius of Loyola, *The Constitutions of the Society of Jesus*, trans. by G. E. Ganss, St. Louis: Institute of Jesuit Sources, 1970, pp. 220-221. Nevertheless, as Roger Ariew (*Descartes among the Scholastics*) and L.W.B. Brockliss (*French Higher Education in the Seventeenth and Eighteenth Centuries,* Oxford: Oxford University Press, 1987) have shown, the Jesuit reliance on Thomism should be nuanced.

[19] "Mistio est generatio misti ex mistilibus alteratis." *Commentarii Collegii Conimbricnesis Societatis Iesu in duos libros De Generatione et Corruptione*, Coimbra: Ex Officina Antonii a Mariz, 1597, bk. 1, chap. 10, art. 2, p. 348. On the *Conimbricenses*'s theory of mixtures see Des Chene, "Wine and water: Honoré Fabri on mixtures," pp. 367-370.

[20] For details of the Scholastic theory of mixtures and particularly the case of wine, see Des Chene, "Wine and water: Honoré Fabri on mixtures." See also Ariew, *Descartes among the Scholastics*, pp. 157–177.

[21] "Probabilior et magis recepta sententia est, elementa non actu et formaliter, sed potestate et secundum qualitates remissas in mixto reperiri." Eustache de Saint-Paul, *Summa Philosophiae Quadripartita*, *De Elementis*, quaest. 12, p. 209.

Thus, in a mixture, all the elements were equally blended and the original qualities suspended so that there were neither any sort of substantial differences within the whole nor any active quality whose role could put at risk the stability of the new mixing compound. Dennis Des Chene called this imperative of Aristotelian understanding of mixtures the homeomeric principle.[22]

3. Soares Lusitano on elements, mixtures and corpuscles

Francisco Soares Lusitano partook, in general terms, in this theory of mixtures. Nevertheless, his approach was far from being a mere paraphrase of the medieval theory of elements and mixtures. Together with other European scholars and physicians, such as the French Honoré Fabri, the Flemish Joannes Pollenter, the Spaniard Pere Bernat d'Olesa i Rovira or the famous Italian Julius Caesar Scaliger,[23] Soares Lusitano in his *Cursus Philosophicus* put forward some hypotheses that historians would find difficult not to consider as *corpuscularian* theses.

3.1 – Elements and mixtures

According to Soares Lusitano's Thomistic understanding, *mixtio est mixtilium alteratorum unio*, which takes place "when the altered elements are brought together under a form, such as when, for example, altered rain and dust are unified under the form of a mouse or frog."[24] The Portuguese philosopher went on to distinguish the proper mixture from that which was accidental. Unlike the true mixture, in which elements are combined and bring about a further form of being (*tertia forma*), in the accidental mixture, elements are joined without changing or creating a new form. This happens, for instance, when two liquors are blended or when salt is dissolved in water.[25] In the case of salt water, for

[22] Des Chene, "Wine and water: Honoré Fabri on mixtures."

[23] See, respectively, Des Chene, "Wine and water: Honoré Fabri on mixtures"; Geert H.W. Vanpaemel (2002), "Jesuit science in the Spanish Netherlands" in M. Feingold (ed.), *Jesuit Science and the Republic of Letters*, Cambridge, Mass.: The MIT Press, pp. 414–418, esp. at p. 416; Víctor Navarro-Brotons, "Matter and Forms in Sixteenth-Century Spain: Some Case Studies" in Daniel Garber and Sophie Roux (ed.), *The Mechanization of Natural Philosophy*, Dordrecht: Springer, 2013, pp. 99-117, esp. at 106-108; Andreas Blank, "Julius Caesar Scaliger on Corpuscles and the Vacuum," *Perspectives on Science* 16 (2008), pp. 137-159.

[24] "*Mixtio est mixtilium alteratorum unio*. Tunc datur, quando Elementa alterata sub una Forma uniuntur, ut cum v.g. pluvia, et pulvis alteratae uniuntur sub Forma muris, aut ranae." Francisco Soares (Lusitano), *Cursus Philosophici. Tomus tertius continens Universam Doctrinam in Libros Aristotelis De Generatione et Anima,* Évora: Ex Typographia Academiae, 1669 (1st ed. 1651), *In libros De Generatione et Corruptione*, disp. 4, p. 73.

[25] "Respondeo dari duas Mixtiones, aliam accidentalem, in qua duo commiscentur non alterata, neque sub una tertia Forma, in ordine ad quam alterentur; et talis est illa, in qua duos

example, salt and water are not unified in a new form. They continue to exist in the mixing compound and, consequently, salt can be separated from water. This was precisely what happened in salt pans (*officinae salis*), where, due to the action of the Sun, the water evaporates and mineral salt rests at the base of the pools previously covered by sea salt water.[26] The process of setting apart salt and water can also be produced by distillation, as Soares Lusitano claims: "if you submit an alembic to a well-regulated fire, an absolutely pure water – as pure and unadulterated as the river water and the water spring – will be extracted and the salt will remain at the bottom of the vessel."[27]

The basic unit of the mixture was, therefore, what Scholastic philosophers defined as the first principle of every physical being: the element. In the same manner as that in which characters were the basic units upon which a phrase was based (to use an image from the Scholastics), so elements were taken as the basic material entities upon which the material world was built. According to him, an element is a corporeal unit (*corpus*) that cannot be further divided into other species, which must be present *in virtute* in the composite bodies,[28] being therefore their irresolvable constituent.[29]

By emphasizing that an element should be taken as a physical body, Francisco Soares relied heavily on Thomas Aquinas's reading of Aristotle, according to which "an element is that out of which a thing is primarily composed, which is immanent in the thing, and which is indivisible according to form."[30] A different understanding was endorsed by the philosophers who followed Duns Scotus, for whom elements were anything but the simulacra of the smallest units of the physical world. Accordingly, the Scotist Claude Frassen

liquores commiscentur: item illa, in qua Sal commiscetur aquae." Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione,* p. 73.

[26] "In officinis salis (quae plurimae in nostra Lusitania, *marinas* dicimus) experimur, colliguntur enim in diversis areolis aquae maris, et ibi ferventem ad solem partes aqueae abeunt in exhalationes, et relinquitur sal." Francisco Soares (Lusitano), *Cursus Philosophici*. *Tomus secundus continens Universam Doctrinam in Libros Aristotelis Physicorum, De Coelo, Meteoris, et Parvis Naturalibus*, Évora: Ex Typographia Academiae, 1669, Évora: Ex Typographia Academiae, 1668 (1st ed. 1651), *De Meteoris*, disp. 5, p. 364.

[27] The complete sentence: "Dicendum ergo existimo salsedinem maris provenire a sale cum eius aquis inmixto. Et probatur, quia aquae maris sale constant. Et hoc est evidens, quia sal ab illis extrahitur, idque non solum in marinis, ut proxime dixi, sed per alambycum, quo, si moderatum adhibeas ignem, excipitur aqua omnino pura, et tam pura, et syncera, ut fluvialis, vel fontana; et in fundo vasis reliquitur sal." Soares (Lusitano), *Cursus Philosophici*, *De Meteoris,* p. 364.

[28] To the question whether the elements continue to exist in the mixtures, Soares responded that "nihilominus probabilius dicendum Elementa non manere in Mixtis secundum proprias Formas, sed solum secundum earum qualitates." Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione*, disp. 4, p. 74.

[29] Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione*, p. 49.

[30] Thomas Aquinas, *De Principiis Naturae*, quoted in Bobik, *Aquinas on Matter and Form and the Elements*, p. 48.

(1620-1711) argued, in the second half of the seventeenth century, that elements are not real entities existing in nature but a merely representation of the role played by the constituents of natural bodies. As he states in his *Philosophia Academica* (1688), "except for those that would be in and make up a compound, there are no elements. Element [*elementum*] is indeed the name of a function [*officium*], not of a natural entity."[31]

Keeping himself within the Thomistic tradition, Francisco Soares maintained that there are four kinds of terrestrial element from which a mixture is made up. Earth is meant to contribute the solid and dry qualities to a mixed body, while water contributes the cold and moist qualities, air contributes the warm and moist qualities, and fire contributes the qualities of warmth and dryness. Within a mixture, these basic elements must be combined in a similar way and proportion in each part as in the whole. The final result of a mixture, as often indicated by Soares Lusitano, is a body made up of solid and relatively flexible matter, with porous parts filled by air.[32]

Soares Lusitano, thus, rejected the position of the alchemists according to which salt, sulfur and mercury (or, even, oil, water and air) are the three basic elements upon which mixtures were made.[33] These principles are not primary elements. As the Portuguese philosopher argued, not only did God not create salt, sulfur and mercury as the *prima rerum exordia*, but these substances were not furnished with the key features that characterized the elements, namely being provided with a great influence (*virtus*) and opposite qualities, being evident to human senses, and having a proper and natural place in nature.[34] Salt, sulfur and mercury were not elements themselves but rather mixtures of elements (as demonstrated by the case of salt).

[31] "Nisi enim inessent et compositum constituerent, elementa non essent. *Elementum* enim nomen est officii, non naturae." Claude Frassen, *Philosophia Academica. Tomus tertius: Tertiam Partem Physicae*, Venice: Nicolaum Pezzana, 1767, p. 58.

[32] Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione*, p. 50.

[33] "Ex dictis manet praeclusus locus opinioni Alchimistarum, qui contendunt Elementa Mixtorum esse pradicta tria, Sal, Sulphur, et Mercurium, quia (ut aiunt) ignis ope haec tria ex cunctis Mixtis educuntur. Alii Chimici dicunt omnia Mixta resolvi in Oleum, Aquam, et Aerem, unde haec tria esse Mixtorum Elementa." Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione*, p. 50.

[34] "Huic, inquam sententiae [of alchemists according to which the three basic elements are salt, sulphur and mercury] locus praeclusus est. Primo, quia Elementa sunt prima Mundi corpora, ex quibus sunt Mixta, quae secunda corpora dicuntur: prima, inquam, tempore, quae videlicet Deus in principio Mundi creavit, et ex quibus reliqua sunt composita; at vero, in principio non creavit Deus ut prima rerum exordia Sal, Sulfur, et Mercurium. Secundo sunt Elementa corpora maxima magnitude, et virtute. Tertio sunt maxime contraria, et maxime activa. Quarto sunt notissima, ac sensibus obvia. Quinto habent propria loca quae omnia solis competunt Terrae, Aquae, Aeri, et Igni, non autem Sali, Sulfuri, et Mercurio, aut Oleo." Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione*, p. 51.

3.2 – Celestial agency and terrestrial mixtures

How do the four elements produce a mixture? How do earth, water, air and fire give rise to a mixing compound? From a Scholastic point of view, considering the actualization of matter, the unification of elements under a new substantial form or the transformation of one element into another required the existence of an external influence. As Anneliese Maier stressed in her seminal study on the Scholastic structure of matter and theory on elements in mixtures, in the process of transforming one element (or a set of elements) into a mixing compound, the substantial form of the original element (or its qualities) cannot provoke the mixing because substantial forms do not work by themselves. An external power was thus required to cause such a process of generation. This power was commonly associated with celestial forces (*virtus caeli*) or intelligences.[35] Francisco Soares Lusitano also identified the external agency with planetary influences. According to him, "the principal cause of mixtures is the celestial bodies; elements are simply their instrumental causes."[36] Certainly, Soares Lusitano's statement is entirely consistent with the Aristotelian-Thomistic theory of celestial influence, according to which the planets were thought to exert a vital influence over the terrestrial region.[37] Although almost every textbook on Aristotelian *De Coelo* tackled this philosophical *topos* in the medieval and early modern period, the Coimbran Jesuits paid special attention to the theory of celestial influence.[38] By reading the *Commentarii Collegii Conimbricensis* on the heavens, while studying at Coimbra, Soares Lusitano learned, for example, that celestial bodies were responsible for phenomena such as heliotropism, the division of the year into four seasons, sea tides, the opening and closing of oysters and other shells or simply the crowing of the cock daily before sunrise.[39] Considered as perfect and incorruptible realities (by the *Conimbricenses*; no longer by Soares Lusitano), the celestial bodies were believed to exercise their vital influence on the terrestrial region by means of their motion, light and occult influence (*influxus*

[35] Maier, "Die Struktur der materiellen Substanz," pp. 12–13.

[36] "Respondeo causas principales Mixtorum esse Coelestia corpora; Elementa solum esse causas instrumentales." Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione,* disp. 4, p. 72.

[37] See Edward Grant, "Medieval and Renaissance Scholastic conceptions on the influence of the celestial region on the terrestrial," *Journal of Medieval and Renaissance Studies* 17 (1987), pp. 1–23 (or E. Grant, *Planets, Stars and Orbs. The Medieval Cosmos, 1200-1687*, Cambridge: Cambridge University Press, 1994, pp. 569-617) and John North, "Celestial Influence - the Major Premise of Astrology," in Paola Zambelli (ed.), *Astrologi hallucinati. Stars and the end of the World in Luther's Time*, Berlin: Walter de Gruyter, 1986, pp. 45-100.

[38] Luís Miguel Carolino, *Ciência, Astrologia e Sociedade. A teoria da influência celeste em Portugal (1593–1755)*, Lisbon: Fundação Calouste Gulbenkian, 2003, pp. 45–77.

[39] *Commentarii Collegii Conimbricensis Societatis Iesu In quatuor libros De Coelo Aristotelis Stagiritae*, Lisbon: Ex officina Simonis Lopesii, 1593, bk. 2, ch. 3, quest. 1, pp. 156–157.

or *influentia*). Through these three instrumentalities, celestial bodies produced the four primary qualities—hotness, coldness, wetness and dryness—which, combined among themselves, particularly in the case of hotness and coldness, acted upon the four basic elements, to produce generation and corruption in the sublunar sphere (that is to say, terrestrial life).[40]

3.3 – Celestial bodies, corpuscles and mixtures

Soares Lusitano agreed, in general terms, with the Scholastic view on celestial influence and on the role played by heavenly bodies in promoting the generation of the mixing compounds.[41] Nevertheless, in his understanding of celestial agency as the *causas principales mixtorum* a place was reserved for a corpuscularian theory. Traditional Scholastic natural philosophy explained the instrumental role of celestial bodies by means of their influence on the equilibrium of the four qualities that generated the elements. Although Soares Lusitano recognized the causal role of qualities, the fact that he argued for the existence and the operational role of small corpuscles in nature allow him to advocate a corpuscularian understanding of natural processes, explaining them as a rearrangement of corpuscles. According to his view, celestial bodies, through their influence, acted upon the thinnest particles or corpuscles of elements and made them join other elements and bring about a *mixtum* under a new form. Based upon the basic Aristotelian notion that the terrestrial region was organized according to the relative weight of the elements,[42] Soares Lusitano claimed that "the influences of the celestial bodies can take the particles of the elements out from their natural places and contrive them."[43]

The origin of coldness on earth caused by Saturn is a good example of the way in which planets induced terrestrial mixtures by means of an occult influence on the small and subtle particles of the elements that filled the atmosphere. Apart from generating coldness on earth *directe et per se*, Soares Lusitano also agreed with the philosophers (whom he did not identify, with the exception of Niccolò Cabeo[44]) who considered that cold was due to the action of Saturn upon the cold minimal particles of bodies, thus putting forward a *physical* (or physically percetible) explanation for the origin of this

[40] For example, "Coelestis influxus, etsi in corporibus, quae interitum subeunt, calorem, frigus, aliasque id genus qualitates efficiat." *Commentarii Collegii Conimbricensis Societatis Iesu In quatuor libros De Coelo,* p. 159.

[41] Cfr. Soares (Lusitano), *Cursus Philosophici*, *De Coelo*, disp. 5, pp. 317–325.

[42] Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione,* disp. 4, pp. 51ff.

[43] "Respondeo hoc solum esse contra particularem naturam huius uel illius Elementi: non contra natura Universi, et *influentias Astrorum, quae a propriis locis possunt extrahere particulas Elementorum et eas commiscere.*" Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione,* p. 72.

[44] On Cabeo, see especially Martin, *Renaissance Meteorology*, pp. 106–124.

natural phenomenon. As these cold subtle particles existed throughout the atmosphere and also in the compound bodies, once stimulated by Saturn, by means of an occult *influentia* (which he distinguished from the Stoic-inspired notion of *simpathia*), they produced coldness on earth.[45] The influence of Saturn was particularly effective upon mineral and saline thin corpuscles. Hence, the influence of this planet was certainly involved in the production of salt, which takes place, according to Soares Lusitano, in the profound and inaccessible caverns of the deep earth.[46]

Soares Lusitano was also drawing on corpuscularian philosophy in order to explain other phenomena of generation that Scholastic philosophers previously understood by means of qualities intrinsic to matter. Rarefaction is a case in point. According to traditional late Aristotelian philosophy, rarefaction was commonly understood as a process involving the elemental primary qualities. It was the result of a different balance of qualities that cause the bodies to expand or contract. This was, for example, the interpretation of the Spanish Jesuit Pedro Hurtado de Mendoza (1578–1651). In his *Universa Philosophia* (Valladolid, 1615), he considered that the rarity and density of matter were due, respectively, to coldness and hotness. He defended this position by remarking that milk and water freeze due to the action of coldness, while, by contrast, under the effect of hotness, they dissolve and expand.[47] Thus, in this case, rarity was thought to arise from the primary quality of coldness.

[45] "Diximus in solutione ad tertiam rationem, Saturnum, non obstante eius luce, frigus influere, propter alias qualitates frigidas, quas habet praedominantes. An autem illud influat per se, illud producendo, an solum per accidens excitando spiritus frigidos, illosque movendo, ac inquietando? Hoc ultimum pluribus placet, iisque ingeniosissimis Philosophis, qui dicunt Saturnum eatenus infrigidare, quatenus movet spiritus frigidos, sive ii salnitrales, et minerales sint, sive cuiuscunque alterius materiae, et naturae, qui spiritus latitant in globo Terrae et Aquae, et dispersi sunt per Aerem (…).

Dari vero tales spiritus, seu partes tenuissimas, easque valde frigidas, late probat P. Cabeus *lib. 4 Meteor. text 1, q. 6* (…)

Ego non inficior posse frigus produci a Saturno praedicta arte, modoque: existimo tamen etiam produci directe et per se. Tum quia videmus illud produci etiam in Provinciis, ac locis, in quibus non existunt talia mineralia salnitrosa." Soares (Lusitano), *Cursus Philosophici, De Coelo,* disp. 5, p. 320.

[46] "Itaque existimo, cum Deus initio Mundi, praeruptis terrae, apertisque cavernis, aquas illis conclusit, admixtis pluribus terrae vaporibus, ac exhalationibus, talem inde mixturam, et temperamentum in mari resultasse, ut influentiis Coelestibus ad generandum salem esset maxime accomodatum." Soares (Lusitano), *Cursus Philosophici, De Meteoris*, disp. 3, p. 364.

[47] "Dicendum igitur est, in raritate neque acquiri maiorem quantitatem, neque in densitate deperdi, nec etiam nova corpora attrahi, aut depelli. Hoc est commune omnibus Aristotelicis, et caeteris fere Scholis. (...) Deinde, quia materiam esse raram aut densam oritur a frigore, et calore. Lac enim frigidum, et aqua glaciant; calore vero solvuntur, ac dilatantur: ergo radix raritatis sunt illae qualitates, quae habent pro effectu formali secundario extendere materiam ad latiorem locum." Pedro Hurtado de Mendoza, *Universa Philosophia*, Lyon: Sumptibus L.

Soares Lusitano had a different approach to this issue. In spite of explaining rarefaction by means of qualities intrinsic to matter, he puts an emphasis on the actions of external causes over the corpuscles. According to him, rarefaction was brought about not by qualities but by corpuscles. As proposed by the Portuguese philosopher (in a position that he attributed to Vallesius), rarefaction took place through the introduction of air and other corpuscles (*corpusculi*) into the pores of the matter. As these corpuscles penetrated inside the matter, the pores became progressively enlarged and the structure of the solid body became more rarefied.[48] Nevertheless, the process of rarefaction could also affect the microstructure of the particles themselves. Faced with the hypothetical question of whether corpuscles could undergo the same kind of rarefaction, Soares Lusitano responded affirmatively. According to him, "if the corpuscles themselves were provided with pores, they could be rarefied by the intromission of other minuscule parts, and in case of having pores, these parts too could suffer rarefaction by the action of very subtle atoms (*atomos*), and so forth up to the point of reaching particles so tiny that they do not have pores."[49] Soares Lusitano proposed, thus, a corpuscularian explanation with respect to this case of *de alteratione* of physical bodies. Once created from the mixing of the four elements under a new form, a mixed body could itself undergo a transformation in its dimensions by the action of elemental corpuscles.

Francisco Soares Lusitano thus put forward a corpuscularian theory of matter that allowed him to explain natural phenomena as cases of mixtures of elements. Just as Honoré Fabri would formulate some years later,[50] Soares's corpuscularianism is neither mechanical, as he did not explain natural phenomena by means of atoms' motion, shape, size or quantity, nor chemical, since, for Soares Lusitano, in a mixture the elements persist only *in virtute,* as already mentioned.

Accordingly, the Portuguese philosopher developed this theory within a Thomistic tradition. Soares Lusitano's analysis of the Aristotelian-Thomistic tradition led him to develop the notion that corpuscles were the fundamental natural causes of physical bodies, being provided with form and matter. By

Prost Haeredis Roville, 1624 (1st ed. 1615), *Disputationes De Substantia Corporea Generabili et Corruptibili,* disp. 4, p. 441.

[48] "Quid sentiendum de opinione, quae docet fieri Rarefactionem per introductionem aeris, et aliorum corpusculorum per poros inter partes intimas quantitatis? Respondeo tenendam esse ut valde probabilem. (…) [Franciscus Vallesius] asserit itaque haec sententia Rarefactionem tunc fieri, cum dissolutis aliquibus partibus aperiuntur pori, et per eos aer, aut aliud corpusculum introducitur, quo dilatantur pori et sic corpus tumet, ac rarefit. Densationem vero docet fieri, cum foras ejiciuntur haec corpuscula; tunc enim comprimuntur pori, et consequenter ipsum corpus." Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione*, disp. 3, p. 46.

[49] "Respondeo ipsa etiam corpuscula, si habeant poros, posse rarescere per intromissionem aliarum partium minutissimarum, et has si habeant poros adhuc posse rarescere per subtilissimas atomos, et sic procedendum donec perveniatur ad particulas adeo exiguas, ut poris careant." Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione*, p. 47.

[50] See Des Chene, "Wine and water: Honoré Fabri on mixtures," p. 378.

doing so, in contrast to Maier's understanding, the Thomistic Soares Lusitano successfully integrated a corpuscularian matter conception within an Aristotelian metaphysical framework based upon notions of forms and matter. This effort to reconcile the Aristotelian-Thomist metaphysics of hylomorphism with corpuscularian theories had a particular impact on Soares Lusitano's theory of mixtures. It allowed him to explain the origin of compound bodies, which Scholastics traditionally explained by means of qualities intrinsic to matter, as the result of an external influence over the corpuscles.

3.4 – *De termino parvitatis*

The evidence that some early modern Scholastics were to some extent able to make use of corpuscularian theories of matter within an Aristotelian philosophical framework has led a few historians to see the rise of corpuscularism as a consequence of the internal development of Aristotelianism, and particularly of the Aristotelian notion of *minima naturalia*. Although it came directly from Aristotle's books on *Physica* and *De Generatione et Corruptione*, the idea of the existence of small units of matter, which were impossible to divide into further parts, had a long history stretching from the Stagirite up to the times of Sennert.[51] In general terms, according to this perspective, which strives to emphasize the continuity between medieval science and that of the *novatores*, from the theoretical position held by Aristotle in the context of the controversy on matter with Anaxagoras, the concept of the "minimum natural" gradually came to be conceived as a physical entity by Averroes and his followers. With Averroes and, particularly, with Renaissance Italian Averroists (Achillinus, Nifo and Zabarella), physical *minima* began to be employed in chemical processes, as physical substances acting upon each other. In the seventeenth century, as Norma Emerton argues,[52] this concept led the way for early modern atomism: "If early seventeenth-century atomists were content to borrow from minimism in a physical context, they were wholly indebted to minimism in a chemical context."[53] The smallest particles transformed into corpuscles were, therefore, to play a role in the chemical and mechanical approach to nature adopted by Sennert, Descartes, Gassendi and others. The link between Scholastic philosophy and early modern science was, therefore, the association of *minima naturalia* with the theory of mixtures.[54]

[51] See, in particular, Pierre Duhem, "Léonard de Vinci et les deux infinis," in P. Duhem, *Études sur Léonard de Vinci*, Paris: A. Hermann, 1909, pp. 3–53, 368–407 and Andrew G. Van Melsen, *From Atomos to Atom. A History of the Concept Atom*, New York: Harper and Brothers, 1960, pp. 58–73.

[52] Norma Emerton, *The Scientific Reinterpretation of Form*, Ithaca: Cornell University Press, 1984, pp. 106–125.

[53] Emerton, *The Scientific Reinterpretation of Form*, p. 107.

[54] See, for example, Van Melsen, *From Atomos to Atom*, pp. 79–80 or Andrew Pyle, *Atomism and its critics. From Democritus to Newton*, Bristol: Thoemmes Press, 1995, pp. 220-221 who

Recently, this point of view has been drastically revised. John Murdoch, for example, in an insightful study on the medieval and Renaissance tradition of *minima naturalia* and its historiography, has argued for the strict separation of the two concepts. "For although the theory of *mixtio* has to do with natural substances, one has no right to assume these substances to be *minima naturalia*."[55] And indeed, Murdoch has clearly demonstrated that there is no evidence in coeval documentation of using the doctrine of *minima naturalia* in the context of the theory of mixtures.

An analysis of Soares Lusitano's treatment of the theory of mixtures corroborates Murdoch's position. In fact, the Portuguese philosopher not only disregarded the concept of *minima naturalia* while discussing the topic on mixtures, but he also argued that a *minima particula* can always be split up. While approaching the issue of the limits of the greatness and smallness of things, Soares did state, in accordance with Aristotle, that the continuum could be divided indefinitely. The only exceptions were living beings with their precise organs and bodies.[56] Both lifeless bodies and material beings had no *terminus parvitatis*.[57]

In short, Soares Lusitano's position on the *terminus parvitatis* and on mixtures suggests taking *minima naturalia* and *mixtio* as two separate theories.

4. Conclusion

Unlike Anneliese Maier's understanding of the (in)capacity of Thomistic tradition to solve the Aristotelian *aporia* with regard to the theory of mixture and its relation with the conception of the structure of material substances, the inspection of the theory of matter and mixtures put forward by the Portuguese Thomistic philosopher Francisco Soares Lusitano reveals that early-modern Thomist philosophers succeeded in integrating corpuscularian theories within the Aristotelian metaphysical framework of matter and form. By arguing that the thinnest particles or corpuscles of elements on account of the influence of celestial bodies were moved and caused the elements to

followed, uncritically, Van Melsen's notes.

[55] John E. Murdoch, "The Medieval and Renaissance tradition of *Minima Naturalia*," in C. Lüthy, J.E. Murdoch, W.R. Newman (eds.), *Late Medieval and Early Modern Corpuscular Matter Theories*, Leiden: Brill, 2001, p. 130.

[56] "Viventia habent praefixum terminum parvitatis, cum intrinsecum, tum extrinsecum." Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione,* disp. 2, p. 30.

[57] "A fortiori reliqua non viventia, ut lapides, arena, vitrum, crystallus, aqua nullum habent terminum parvitatis, idque neque quoad generationem, neque quoad conservationem. (…) Et probatur facile, quia nulla potest esse particula stupae, aut pulveris pyrii, seu tormentarii adeo exigua, quae si applicetur igni, ab eo non corripiatur. Et confirmatur, quia illa minima particula potest corrumpi: ergo potest in ea aliqua Forma generari; alias maneret illa Materia sine forma." Soares (Lusitano), *Cursus Philosophici*, *De Generatione et Corruptione,* p. 30.

assemble together, thus originating the blending of mixable elements under a new substantial form, Soares Lusitano's case demonstrates that hylomorphism and corpuscular matter theories did not appear as incompatible philosophies to early modern Aristotelians. In short, corpuscularism did not intrinsically conflict with late Aristotelian philosophy, as is so often claimed in current textbooks on the Scientific Revolution.

Nevertheless, the ability of Scholastic authors to deal straightforwardly with the theory of corpuscles had no exclusive connection with the Aristotelian hypothesis on *minima naturalia*. Several Aristotelians have made use of the theory of corpuscles and, at the same time, vigorously argued for the infinite divisibility of matter. This is particularly true in the case of Soares Lusitano, who drew successfully on the theory of corpuscles in the context of mixtures and, at the same time, argued that physical bodies had no *terminus parvitatis*.

That is to say, in this particular case, the integration of corpuscularism within the Aristotelian framework of natural philosophy depended more upon the flexible and creative character of this eclectic and heterogeneous philosophical branch or, in other words, on its capacity to work with external and impelling elements, rather than upon its own internal development.

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Atoms and Providence in the natural philosophy of Francis Coventriensis, 1652

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Abstract: During the Interregnum, English natural philosophers and chymists became deeply interested in Pierre Gassendi's revival of Epicurean atomism. In the English context, strategies to accommodate atomism to Christian doctrines were fraught with religious and political implications. English Roman Catholics differed from their Protestant compatriots in insisting that God did not cease to operate miracles at the close of the apostolic age. The English friar known as Franciscus à Sancta Clara embraced atomism on the grounds that a new and better science of material causes was indispensable for the accurate assessment of God's recent and future miracles.

Keywords: *Franciscus à Sancta Clara, Christopher Davenport, Robert Boyle, Walter Charleton, Pierre Gassendi, atomism, Epicurean atoms, effluvia, Interregnum, miracle of Calanda.*

Few periods have been more pivotal to English theories of matter than the years between 1650 and 1654, when both Robert Boyle and Walter Charleton became interested in Gassendi's revival of Epicurean atoms.[1] In unpublished remarks on *Atomicall Philosophy* written between 1651 and 1653, Boyle argued that Epicurean Atomism had perhaps been maligned by Aristotelians and deserved fresh consideration.[2] Charleton, in turn, warmed up to Epicurus

[1] Robert Kargon, "Walter Charleton, Robert Boyle and the Acceptance of Epicurean Atomism in England," *Isis,* Vol. 55, No. 2 (June, 1964) 184–192; Nina Rattner Glebart, "The Intellectual Development of Walter Charleton," *Ambix,* XVIII, No. 3 (November, 1971), 149–167.

[2] Robert Boyle, *Atomicall Philosophy,* in Hunter and Davis, *Works,* Vol. 13, 227–234 (Citation on 228). See, further, William Newman, *Atoms and Alchemy: Chymistry and the Experimental origins of the Scientific Revolution* (Chicago: U. of Chicago Press, 2006) 163; and "The Alchemical

by first grappling with religious objections. In 1652, half-way between his Helmontian *Ternary of Paradoxes* (1650) and his pioneering embrace of Epicurean Atomism in *Physiologia Epicuro-Gassendo-Charltoniana* (1654), Charleton published a "physico-theological" treatise against atheism entitled *The Darkness of Atheism dispelled by the light of nature*. In this treatise, he pointed out that, with the right corrections, Epicurean atoms offered considerable explanatory power along with relatively few drawbacks.[3]

The purpose of the present paper is to flesh out the English reception of Epicurus in 1652 by calling attention to a philosophical treatise that was written by the English Franciscan priest known as Franciscus à Sancta Clara. Written in Latin and approved by three Roman Catholic censors, Sancta Clara's philosophical treatise was published in Antwerp in May 1652 with the title "Philosophical Additions to the Peripatetic World," (*Paralipomena philosophica de mundo peripatetico*). In this work, Sancta Clara endorses Epicurus and contributes in a distinctly Roman Catholic way to the religious taming of Atomism.

Let us first review a key aspect of Charleton's own taming of Atomism in 1652. Going beyond Gassendi, Charleton argued that Epicurean Atomism could not only be reframed to include God's creative agency *ex nihilo* but also to accomodate God's continued providence. Nothing prevents God, he argued, from moderating and conserving the re-combinations of atoms that arise from the divine laws that God Himself devised at Creation.[4] God's special providence, Charleton added, is also safe: since God is "an absolute Monarch," God "can at pleasure alter, transcend, or pervert" the Statutes that he has freely created to govern material events and bring about "any extraordinary effect, which his providence hath decreed, of universal, or particular benefit."[5] While Charleton refrained from claiming that new divine miracles had occurred since the close of the Apostolic age,[6] he insisted that new miracles *could* occur based on the fact that God had, in the past, "frequently manifested his Supremacy by working effects as well above as against the establisht and customary power of natural Agents" and that "the fountain of his energy" had not "dryed up."[7] Once corrected to replace random motion with God's laws, Atomism in itself does not preclude divine miracles, now or in the future. It seems that what Charleton welcomed most in Atomism, at least in the

Sources of Robert Boyle's Corpuscular Philosophy," *Annals of Science,* 53 (1996), 567–585. See also J.J. MacIntosh, "Boyle on Epicurean atheism and atomism," in Margaret J. Osler, ed., *Atoms, Pneuma and Tranquility* (Cambridge, UK: Cambridge U. Press, 1991), 200–201.

[3] Walter Charleton, *The darkness of atheism dispelled,* 1652, Chap. II, Section II, 46–47.

[4] Robert Kargon, "Walter Charleton, Robert Boyle and the Acceptance of Epicurean Atomism in England," 22.

[5] W. Charleton, *The darkness of atheism dispelled,* Chap. 4, 136.

[6] On the Anglican doctrine of the cessation of miracles, see e.g. J.J. MacIntosh, *Boyle on Atheism* (Toronto: U. of Toronto Press, 2005), 203 ff.

[7] W. Charleton, *The darkness of atheism dispelled,* Chap. 4, 137.

context of refuting atheism, was a theory of matter to which God's initiative as a free efficient cause—as Creator, then as Conserver and Provider—could smoothly be added and indeed in which it could be emphasized.

For a Roman Catholic priest and Franciscan friar like Sancta Clara, the question of God's prerogative in regard to miracles, as we will see, had special significance. When Sancta Clara published *Paralipomena philosophica de mundo peripatetico*, he was serving as the elected Provincial of his Order for the second time, which means that he travelled back and forth between London and the College of St. Bonaventure in Douai. Among the novices and students at St. Bonaventure's in the early 1650's was Antoine Le Grand, the future apologist of *The Divine Epicurus* (1669) and exponent of Cartesian philosophy (1671). In 1657, fresh from Sancta Clara's teaching, Antoine Le Grand would be appointed by his Order to teach philosophy at a secret Franciscan school in London.[8]

On the cover page of *Paralipomena philosophica de mundo peripatetico,* Sancta Clara identified himself as "Father Franciscus *Coventriensis*," referring to his place of birth, in the fashion of medieval scholastics. He also revealed that he had studied "long ago" at Magdalen Hall, Oxford, where Thomas Hobbes and Walter Charleton had also studied.[9] The detail is not without importance. In 1650, Sancta Clara had published a detailed refutation of Hobbes's ecclesiastic views, explicitly calling for debates at Oxford and Cambridge.[10] In 1651, *Leviathan* had heaped contempt both on Aristotle's "Vain Philosophy" and on the Roman Catholic doctrine of miracles.[11] Sancta Clara was a close friend of the philosopher-priest Thomas "Blackloe" White, whose natural philosophy Hobbes had critiqued in detail.[12] In 1648, Sancta Clara had published a massive treatise of theology, *Systema fidei,* in which he had praised White's and Digby's natural philosophy, defended Cartesian principles and Copernican cosmology, and stressed that God's church has no divine authority in philosophical matters.[13] The last chapter of *Systema fidei* was dedicated to Kenelm Digby,[14] who had introduced Hobbes to Mersenne

[8] John Berchmans Dockery, OFM, *Christopher Davenport, Friar and Diplomat* (London: Burns and Oats, 1960) 122.

[9] Juhana Lemetti, *Historical Dictionary of Hobbes's Philosophy* (Plymouth, UK.: Scarecrow U. Press, 2012) 6 and 75.

[10] Anne Davenport, "Reading Hobbes before Leviathan: The case of Philip Scot," *Hobbes Studies* 27 (2014) 1–21.

[11] T. Hobbes, *Leviathan,* London, 1651, Part 4, Chap. 46, 373 and 379.

[12] T. Hobbes, *Thomas White's 'De Mundo' Examined,* trans. by H. W. Jones (London: Bradford U. Press, 1976).

[13] Anne Davenport, "English Recusant Networks and the Early Defense of Cartesian Philosophy," *Journal of Early Modern Studies,* Vol. I (2012, Fall) 65–86.

[14] F. à Sancta Clara, *Systema fidei* (Liège, 1648), 506.

and whom Robert Boyle included in the list of Atomist revivalists as "our deservedly famous Countryman."[15]

In what context does our Franciscan endorse Epicurus? The opening chapter of *Paralipomena philosophica de Mundo Peripatetico* asks about prime matter. Father Francis *Coventriensis* explains that, although he was reared on Aristotelian principles, he will consider all points of view without prejudice. Citing Aristotle's definition of prime matter as "*nec quid nec quantum nec quale"* in Metaphysics 7, c. 3, Father Francis starts by considering Thomas Aquinas's interpretation that prime matter is "pure potentiality." Is this the best interpretation of Aristotle's definition? There are two problems. First, as John Duns Scotus points out, interpreting prime matter to be "pure potentiality" rules out the possibility of entities composed of prime matter and form, since a thing cannot be composed of what lacks actual being.[16] Secondly, a thought experiment that was not available to Aristotle but which Christian philosophers cannot ignore shows that no contradiction prevents God from maintaining prime matter in existence supernaturally by absolute power. Consequently, prime matter is a proper entity, separable by God. The Scotist conclusion is further corroborated by Scripture, since indeed Genesis reveals that prime matter is the positive result of God's creative act and thus exists independently of supervening forms.[17] On the empirical side, in turn, there is the experimental evidence of "Chymical philosophers." These Chymists speculate that what they see in their alembics after their fiery reductions of artificial mixtures is prime matter. Is their claim valid? While Father Francis sees no need to reject Aristotle's definition of prime matter flat out, he argues that an interpretation must be found that takes the Scotist *critique* as well as experimental results into consideration.

Having laid out the criteria to be satisfied, Father Francis now states that some very notable philosophers (*egregii philosophi)* concur in teaching that "prime matter is some kind of diffuse or fluid humor" as "Epicurus abundantly argues when he says that the whole universe is held together through his atoms, or what he calls corpuscles. From these atoms, all things emerge according to him." *Ut satis insinuat Epicurus per suos atomos seu quae vocat corpuscula:* making no distinction between "atoms" and "corpuscles," Father Francis attributes both terms to Epicurus himself. Like Boyle, he seems to assume that Epicurean atoms are viable because they are physically, rather

[15] Boyle, *Atomicall Philosophy,* cited by J.J. MacIntosh, *Atoms, Pneuma and Tranquility,* 202.

[16] For further discussion of Scotus's views on prime matter, see Peter King, "Scotus on metaphysics," in Thomas Williams, ed., *The Cambridge Companion to Duns Scotus* (Cambridge, U.K.: Cambridge U. Press, 2003), 49–56; and Thomas M. Ward, *John Duns Scotus on Parts, Wholes, and Hylomorphism* (Leiden: Brill, 2014), 6–52.

[17] Cf. Boyle's appeal to Genesis in *Works,* Vol. 13, 154: "Genesis, comprises more true solid, & praegnant Principles of Naturall Filosophy then Aristotle & all his Commentators put together."

than mathematically, indivisible.[18] He interprets the chief claim of Epicurus's theory to be that indivisible material building blocks make up all bodies universally, without distinction between celestial bodies and sublunar bodies.

What is known about the atoms that hold the whole universe together? Atoms, Father Francis says, consist of an extremely tenuous "vapor," analogous to the terrestrial vapors cited by Pico della Mirandola as drawn upwards from the earth by the sun's heat and then condensed through the impact of cold regions.[19] In this thinnest of vapors, every form is easily imprinted (*facile omnis forma imprimatur).* This first-created "humor" takes on subsequent forms through divine agency — hence the statement in *Genesis* that "the Spirit of God moved over the water." What is meant is that God gave his very own Spirit, which is to say the universal Spirit of "dispositional fluidity" to matter, which is thus metaphorically termed "water."[20] Presumably, what Father Francis has in mind is that some kind of essential flexibility, even indeterminacy, is bestowed upon Epicurus's atoms by God, giving them a character that is reminiscent of water. Given Father Francis's personal closeness to Thomas White, a likely source of his view is White's theory in *De mundo dialogi tres* (1642), where White argues that "quantity is liquidity"—provoking Hobbes's bitterest sarcasm.[21]

A few paragraphs later, the theory is adjusted when Father Francis rejects the claim that Chymists reduce compounds down to "pure prime matter" or "even to prime matter endowed with its co-natural and universal spirit."[22] Conceptually, Father Francis now distinguishes between "pure prime matter" and "prime matter endowed with God's spirit," the latter of which he now terms "*materia secunda*."[23] Implicitly appealing to two Scotist "moments of nature"—logically successive but chronologically instantaneous steps—Father

[18] R. Boyle, *Works,* Vol. 13, 227.

[19] E.g., Giovanni Pico della Mirandola, "Heptaplus," I and IV, in *Œuvres philosophiques,* texte latin, traduction et notes par Olivier Boulnois et Giuseppe Tognon (Paris: PUF, 1993). For further context, see Christine Göttler,"Preface: Vapours and Veils" in C. Göttler and Wolfgand Neuber eds, *Spirits unseen: the Representation of Subtle Bodies in Early Modern European Culture* (Leiden: Brill, 2008), xxii.

[20] *Paralipomena philosophica,* Cap. I, 5: "Ideó dicitur Geneseos I, *Spiritus Domini ferebatur super aquas,* hoc est Deus dedit Spiritum suum, id est, Spiritum universalem fluxis dispositionibus materiae, que scilicet ideo dicuntur aque propter fluxibilitatem."

[21] Thomas White, *De mundo dialogi tres,* Dialogue I, Problem V; Thomas Hobbes, *Thomas White's De Mundo Examined,* translated from the Latin by Harold Whitmore Jones (London: Bradford U. Press, 1976) Chapter V, 6, 63–64. See also Thomas White, *Peripateticall institutions* (1656), Second Book, 43 and 47.

[22] *Paralipomena philosophica,* Cap. I, 6: "Dico igitur constanter, quod in omni resolutione artificiali, nunquam devenitur ad puram materiam primam, imo nequidem ad materiam primam cum suo conaturali et universali spiritu seu formam solam indutam, quae habet rationem comprincipii cum materia."

[23] *Paralipomena philosophica,* Cap. I, 8: "Materia secunda, hoc est, prima cum sua forma universali."

Francis implies that God's first creative act consists in creating Epicurean atoms *ex nihilo* and "informing" them immediately with his own divine spirit. The resulting combination of pure prime matter and "fluid" form is "secondary matter." There "can be no doubt," Father Francis says, that "prime matter clothed with God's spirit" is naturally flexible, since "out of it and in it, all things have their origin, *primary elements as well as secondary things*."[24] Indeed the underlying material unity of cosmic bodies explains why "the whole visible universe is seen to be thoroughly and most absolutely ordered"—which "the religious philosopher concedes as well as all pagan philosophers."

How are atoms, primary elements and secondary things related? Father Francis starts with Aristotle's definition that an element is a "body into which other bodies divide, existing either actually or potentially in these other bodies, and indivisible in kind." He then states that elements are "undoubtedly" what emerge first out of prime matter. What he means (*volo dicere)* is that elements are "primeval bodies" that are simple *(simplicia)* and are educed immediately by God's agency to be seminal principles. As such, elements are adapted to the whole universe and disposed to be proximate principles of all things. Elements are universal principles in the precise sense that all bodies are composed of them and are resolved back into them, as "philosophers who experiment with fire" claim. Elements are not made out of anything else or out of each other, while all other things are made up of them. Elements combine, for example, to make up "secondary" things, such as Salt, Mercury and Sulphur, which are obtained artificially by Chymists, as Jean d'Espagnet explains in his *Enchiridion*.[25] Later, Father Francis calls Sulphur, Mercury and Salt "secondary elements or principles,"[26] recalling Sennert's idea of *prima mista,* "primary mixtures" composed of atomic elements.[27] Secondary elements combine, in turn, to form metals through the influence of heavenly rays—the nobler metals receiving a more powerful celestial influence.[28] In other words, Epicurean atoms "clothed" by God with seminal powers nicely fit Aristotle's definition of elements.

Sympathetic as he is to chemical experiments, Father Francis says that he "cannot understand" why Chymists think that they reach all the way down to prime matter through their reductions. No matter how minute, what they

[24] *Paralipomena philosophica,* Cap. I, 5: "Esse igitur entitatem facile fusilem dubitari non potest, cum ex et in eo omnium rerum elementa tam prima quam secunda ortum habeant." Emphasis added.

[25] *Paralipomena philosophica,* Cap. I, 8. On Sennert's view of *prima mista*, see William Newman, "The Alchemical Sources of Robert Boyle's Corpuscular Philosophy," 574.

[26] *Paralipomena philosophica,* Cap. 13, 168: "Mineralia sunt tria, quae vocantur secunda elementa seu principia, sc. Sulphur, Mercurius et sal."

[27] On Sennert's view, see William Newman's watershed article "The Alchemical Sources of Robert Boyle's Corpuscular Philosophy," *Annals of Science,* 53 (1996), 567–585, most especially 574.

[28] *Paralipomena philosophica,* Cap. 13, 168.

obtain is still visible and still a body.[29] Nothing that is visible is either prime matter, *materia secunda* or even "primary elements." What Chymists exhibit in their alembics as the final residue of reduction are "secondary elements." Father Francis explains that much confusion stems from the fact that people mistake the elements of sense experience, namely ordinary water, air, fire and earth, to be true elements. Rather, true elements are perfectly simple (*simplicia*) and are undetectable to sense.[30] In a later discussion, Father Francis reiterates his personal conviction that "pure elements" are not "subject to the senses." Any colored and visible body, no matter how minute, is a mixture of invisible true elements.[31]

In itself, the essential "fluidity" or indeterminacy of the *materia secunda* out of which God "raises" primary elements subverts the Aristotelian doctrine of absolute place. Father Francis insists that atoms, as such, "require no place"—meaning that they have no essential teleological resting place. What is true for *materia secunda* remains true for *materia secunda* "clothed with primary and true elements." Primary elements seek no essential and privileged resting place.[32] Father Francis offers the following evidence: despite receiving so many thousands of corpses over the centuries, English soil has not expanded its boundaries. This proves that corpses disintegrate into material residue that has no essential inclination to find rest near the center of the earth. Augustine confirms the indifference of primary elements to cosmic place when he explains that corpses at the Resurrection will not be gathered only from the earth but also from the most remote "receptacles" where the substance of bodies has become enclosed through various mutations.[33] In other words, if Aristotle's definition of prime matter is carefully re-interpreted in light of Scotus and then of Epicurus, then Aristotle's doctrine tying elements to absolute "place" must be discarded. True elements, namely atoms endowed by divine decree with seminal properties, are equally at home on the moon, in the heavens or on earth. It follows that the heavens and celestial bodies are corruptible—which is the Scotist doctrine and which is confirmed by recent observations made by means of telescopes.[34]

[29] *Paralipomena philosophica,* Cap. I, 6.

[30] *Paralipomena philosophica,* Cap. 2, 24.

[31] *Paralipomena philosophica,* Cap. 15, 207. The context is a discussion of the bodies assumed by angels when appearing to human beings. For a further discussion, see A. Davenport, "Baroque Fire (A Note on early-Modern Angelology)", *Early Science and Medicine* 14 (2009), 369–397, especially 379–389.

[32] *Paralipomena philosophica,* Cap. I, 8: "Nam certè materia secunda, hoc est, prima cum sua forma universali non exigit locum, imo nec cum elementis primis et veris induta."

[33] *Paralipomena philosophica,* Cap. I, 8–9; citing Augustine's *De cura pro mortuis,* c. 2. It is interesting to note that two editions of *De cura pro mortuis* in English translation were published in England by the secret press, first in 1636 and then in 1651. English Franciscans, obviously, had a very special interest in burials and prayers for the dead as a source of alms.

[34] *Paralipomena philosophica,* Cap. I, 18.

Do elements remain in mixtures? Father Francis starts by reiterating that what we commonly call "elements" are actually mixtures of primary elements—as Van Helmont once explained to him while reducing ambient air to sub-components by means of fire.[35] True elements, unlike the so-called "elements" of common experience, have a robust "form" bestowed upon them directly by divine agency. Since "fluid" atoms are "informed" immediately by God to become primary elements, the fusion of matter and form in true elements is perfectly stable. It follows that elements remain, as such, in mixtures. First of all, logically speaking, mixtures would not be *mixtures,* Father Francis says, if the component elements ceased to exist as components. Once again, Aristotle's definition of mixtures in *De generatione* Bk. I, is useful as a working hypothesis, but requires careful interpretation in light of recent discoveries. In particular, true elements possess a God-instituted indestructibility that mixtures such as ambient air lack. By the same token, primary elements are never more than juxtaposed when they are combined in mixtures, presumably even when they are combined to make up "secondary elements," namely Sulphur, Mercury and Salt—granted that these "secondary elements" may possess some sort of relative experimental stability. The point is that neither nature nor human art can strip elements of their seminal power any more than nature or human art can strip atoms of their essential fluidity. On the other hand, the "form" of ambient air supervenes as a result of mixture and is unstable. Both nature and human art can reduce ambient air into smaller components. In a later chapter, Father Francis stresses that ordinary water "contains all four elements, granted that it contains more water" and that water may be considered to be "purer" when it contains "fewer atoms of earth."[36]

So far, Father Francis implies that God's three consecutive (but instantaneous) creative acts consist in (1) creating Epicurean atoms (*pura materia prima)*, (2) giving these atoms the form of "dispositional fluidity" (*materia secunda)* and (3) raising (a subset of?) diffusive atoms into simple "primeval bodies" endowed with seminal power (*elementa).* The Peripatetic doctrine that "matter is inclined to all forms" must be reinterpreted, Father Francis says, to mean that the seminal cause of all forms lies "in the very essence and quiddity of matter." Although matter, as such, has only "the most minute" being, matter has its own "objective concept," like all entities.[37] Citing Gasparo Contarini, Father Francis explains further that multiple essential degrees are contained in "the womb of matter" and are triggered into manifestation by shifting dispositions and circumstances, "now one degree or form is produced,

[35] *Paralipomena philosophica,* Cap. II (De Elementis et an maneant in mixta), 22: "Et quod minus apparet, aer communis resolvitur per ignem, ut semel mihi declaravit D. Helmontius celebris medicus Bruxellensis, in alembico tunc operans ad eius resolutionem."

[36] *Paralipomena philosophica,* Cap. 13, 173 and 170, respectively.

[37] *Paralipomena philosophica,* Cap. I, 9.

now another," which were first "enclosed in matter."[38] What is new, perhaps, is that hylomorphism in the strong Aristotelian sense stops at God's creation of elementary particles. Subsequent forms that are triggered when elementary particles are combined do not erase the forms of component elements but merely dominate them. Matter, moreover, does not "seek" form. Matter simply executes God's plan mechanically by reacting to efficient causes that bring out the various "degrees of being" that God has inscribed in invisible and (naturally) indestructible atoms.

When elements are combined, a third "*forma mixti"* arises, analogous to the "third" form that emerges from crossing the form of a horse with the form of a donkey.[39] To the objection that this implies that the form of a natural mixture (e.g., a horse) is never essential but merely accidental, Father Francis answers that a plurality of subordinated forms suffices to account for a thing's nature. Since there are no natural "contraries," many successive forms co-exist coherently under a single dominant supreme form, in the way that the form of corporeity is subordinated to the form of man in a given human being. In elements, as we saw, the form of diffusiveness is prior to the "seminal" form and subordinated to it. The doctrine of the plurality of forms, dear to Franciscans, is not only validated by a new Atomistic theory of matter, it provides a ready-made framework in which to solve a key problem that Atomism raises.[40]

Another doctrine that is dear to Franciscans finds critical new validation in Atomism. Enamoured of light and of optics, Franciscans had long cherished the Neoplatonic theory that all things, not just the sun and stars, radiate in all directions.[41] Father Francis starts by citing Epicurus from Diogenes Laertes Bk. 10 to explain that cosmic space is isotropic, so that the marvelous variety of things both in the heavens and on earth comes from influences radiating out from stars and planets to every corner of the universe. The variety of motions, orbits and conjunctions according to which celestial bodies move because of their various "complexions" keeps the universe from stagnating.[42] The harmony of the cosmos results from its constant ferment. Mixtures are triggered, dissolved and reconfigured, chiefly by means of continuous celestial influences, which are themselves the result of mixtures and influences. Father Francis is delighted to point out that the Epicurean theory fits comfortably

[38] Ibid. Cf., presumably, Gasparo Contarini's *De elementis et eorum mixtionibus libri V.*

[39] *Paralipomena philosophica,* Cap. II, 25: "Videtur igitur quod elementorum formae sunt primae in materia prima, tunc miscentur, tunc ex illis formis sit tertia forma mixti; sicut ex formae asinae et equi."

[40] Cf *Paralipomena philosophica,* Cap. XV, 104–5, which defends the plurality of "really distinct" forms/souls in human beings. The Franciscans Francis de Mayrones and William of Ockham are cited.

[41] See e.g. David C. Lindberg, "Roger Bacon on Light, Vision, and the Universal Emanation of Force," in *Roger Bacon and the Sciences,* ed. Jeremiah Hackett (Leiden: Brill, 1997), 243–275.

[42] *Paralipomena philosophica,* Cap. III (*De Coelo*), 34.

with widely-endorsed theories drawn from other philosophical traditions. Indeed, as many great authorities in the past believed, most notably Algazel, Averroes, Thomas Aquinas, Scotus, Bradwardine and many more Catholic theologians, celestial influences produce all of the admirable variety of cosmic effects, in higher bodies as well as inferior ones. If anyone could know the full order of heavenly harmony, Father Francis says, there is no doubt that he would also know the precise configuration of the elemental world with regard to every place and time as in its cause. And this, Father Francis now affirms, "is what Epicurus teaches most constantly, namely that the world is conserved through the communication of atoms."[43] Mindful of any opportunity to harmonize the new physics with the letter, if not the content, of Aristotle's doctrine, he adds that atomic effluvia are "perhaps" what Aristotle meant when he affirmed that "a celestial spirit is in all things."[44]

The theory of atomic effluvia conciliates Epicurus, Arab philosophers and Catholic theologians without contradicting Aristotle *simpliciter*. A welcome place of convergence, the Epicurean theory explains everything from sunspots to meteors, the formation of metals deep in the earth and winds above, the healing power of springs, friendship, conjugal bliss, infectious contagion and nausea.[45] It provides a sort of grand unified theory, connecting all material phenomena dynamically in a seamless cosmos in which air and ether are continuous, made up, as Epicurus teaches, of the same underlying elements.[46] Since atomic effluvia work over vast distances (indeed how far, nobody knows), the theory of atomic effluvia accounts for action at a distance mechanically, without recourse to occult forces, even in the case of amulets.[47] The theory of atomic effluvia solves the mystery of how celestial influences are generated since diffusive atoms radiate out from stars and planets as proximate conditions change, just as they radiate out from rivers, cats and men. Most important of all, the theory of atomic effluvia accounts for cosmic order down to the most minute detail. A world made up of Epicurean atoms that are "informed" by God and communicate through streaming effluvia is no more random than Aristotle's universe, where the size of a fly's wing cannot

[43] *Paralipomena philosophica,* Cap. VI, Par. Secundus, 116: "Et hoc est quod docet Epicurus tam constanter, mundum ex communicatione atomorum conservari."

[44] Ibid.: "Hoc forte vult Philosophus 2 de Generatione, dicens quod spiritus coelestis est in omnibus."

[45] *Paralipomena philosophica,* Cap. VI (De Influentiis Coelorum; ubi varia curiosa examinantur), 117. For Boyle's own emphasis on atomic effluvia, see "Atomicall philosophy," *Works,* Bk. XIII, 229–231.

[46] *Paralipomena philosophica,* Cap. II, 29.

[47] *Paralipomena philsophica,* Cap. IV, 55; "non per qualitates occultas, quas natura non novit, sed per radios." For Boyle's interest in amulets and atomic effluvia, see "Atomicall philosophy," in *Works,* Bk. XIII, 230 and 234.

be changed arbitrarily.[48] The universe that is conserved by atomic effluvia, Father Francis concludes, is like a great clock (*horologium)* with finely attuned interdependent parts. This is why Angels can foresee events in the distant future, anticipating the production of the most minute things, foreseeing even monsters and what common opinion believes to be fortuitous effects when in truth these effects result from Nature's inviolable laws, instituted by God from the start of creation.[49]

Cosmic order is no less secure, no less regulated, no less structured, on the corrected hypothesis of Epicurean atoms than it was on the hypothesis of prime matter as "pure potentiality." Chance is abolished. Implicitly, God plans that no two flowers be exactly alike in "complexion," investing singularity with Providential purpose. God's Providence not only conserves the cosmic "clockwork" through inviolable laws governing atomic effluvia, but unfolds a divine plan marked by surprising new phenomena.[50] Created *ex nihilo* by God, matter is no longer viewed negatively as the unavoidable cause of imperfect tokens of eternal forms, but is viewed positively as God's means to individualize every creature event in space and time. God's Providence, inscribed in advance into atomic "seeds," wields Time artistically to mold Creation into a linearly unfolding History.

Does God's finely-attuned cosmic clockwork, however, logically rule out the effectiveness of prayers and the possibility of miracles? Closely adhering to Scotus, Father Francis points out that Aristotle failed to grasp God's true power as an efficient cause because he had no reason to reach beyond a cosmic Prime Mover. As a consequence, Aristotle limited God's efficient agency to what could be produced by means of the celestial intelligences and denied that God has any care or knowledge of particulars. After comparing Aristotle's texts and examining various views, Father Francis adopts the doctrine that God created not only secondary causes but simultaneously with them created all of their future operations and effects. God did not act in a piecemeal way, he says, as though dividing his creative agency into particular causes. Rather, through a single coherent and universal act, God endowed each and every particular nature with its own proper and distinctive operations, thanks to which

[48] *Paralipomena philosophica,* Cap. III, 35: "Imo tantus est superiorum et inferiorum nexus, quod si hodie aliquid excideret ex universii ordine licet in se minutissimum, totum mundum contunderet, loquor secundum vires nature. Miror verò quod soluit *Philosophus* illud intelligi de potentia Dei, nempè *Deum* non posse alam muscae ampliorem facere, ordine nempe universali semel inverso vel unius partis ad alteram compactione disrupti, ut apparet in catena vel in horologio, totum dislocatur."

[49] Ibid, and 36. Cf. Boyle, *Works,* Vol. 13, 287: "And yet the Artificer that made this Clocke, did very well foresee, and Intend that at such times and by such a consention of motions and upon such Junctures of Circumstances those very things should happen after one another, which to him which knew not the nature and frame of the Clocke nor the Designe of him that made it, would seem very Irregular and casuall."

[50] Ibid, and, further, *Prosecutio*, Cap. 4, 81–82.

the entire diversity of the world is continuously elicited.[51] Implicitly, various combinations of atoms give rise mechanically to various "natures" with pre-ordained properties.

It follows that God's Providence does not end at the lunar sphere, as Maimonides feared, based on Aristotle.[52] Rather, God's providence fills and governs the universe down to the last atom. Consequently, as Bradwardine teaches, all of our prayers must really reduce to the prayer, taught to us by God, that God's will be done.[53] Thomas White elaborates to argue that the prayers of saints are answered because God always wills what is best. To pray that God's will be done is to pray that the prayers of God's saints be answered since what saints pray for is what God views as best. White's theory implies that saintly prayers are effective because they call God's attention, as it were, to what God wills as best, including that saintly prayers be effective. Thomas White even teaches that the prayers of saints are more powerful than natural forces, although he cannot, of course, prove it.[54] Implicitly, God endowed human nature with free agency in the same coherent act through which he ordained the emergence out of atoms of various "natures" with pre-ordained future operations and effects. The saint's freedom to pray that God's will be done on earth as in heaven is itself providential and cooperates with God's plan to redeem creation from the effects of original sin.

A fortiori, Aristotle had no grounds to conceive of the possibility of miracles and could only reject miracles as absurd. Once God's power as an efficient cause is recognized, however, it cannot be rationally supposed that God's agency is constrained by the operations that God himself has instilled in matter.[55] As Augustine puts it, God's miracles do not exclude nature absolutely since they are brought about *in* nature, granted that they are not brought about *by* nature.[56] Over and beyond conserving the cosmic clockwork, God sometimes manifests his providence either by producing natural effects without recourse to secondary causes or by producing effects that could not occur naturally.[57] How are miracles ascertained? Knowledge of natural philosophy is precisely what allows human beings to discriminate critically between natural

[51] *Paralipomena philosophica,* Cap. 4 (De Miraculis, ubi efficientia et cognitio Dei ad extra secundum philosophum examinantur), 41.

[52] *Paralipomena philosophica,* Cap. 4, 42.

[53] *Paralipomena philosophica,* Prosecutio Capitis 4, 80.

[54] *Paralipomena philosophica,* Prosecutio Capitis 4, 81.

[55] *Paralipomena philosophica,* Cap. 4, 36: "Ridiculum videri dicere *Deum* (sic) suam omnipotentiam impotentem reddidisse per illas leges, quas in ordine ad totam naturam conservandam ultrò constituit."

[56] *Paralipomena philosophica,* Cap. 4, 47; citing Augustine, *De cura pro mortuis,* c. 16.

[57] *Paralipomena philosophica,* Cap. 4, 64. Sancta Clara's view concurs with Augustine's definition in *De utilitate credenda* 16, 34, but emphasizes that a familiar event achieved without natural causes counts as "quidquid arduum aut insolitum." I thank the anonymous JEMS reviewer for calling my attention to this passage.

"wonders" and genuine divine miracles. The Christian philosopher, Father Francis urges, must neither be credulous nor close-minded. Consequently, he must urgently keep abreast of the most cutting-edge discoveries of natural philosophy and probe their scope so as to be able to judge whether an effect falls within the range of natural causation or not. To mistake a natural but rare event for a divine manifestation is to be culpably superstitious — but to deny a genuine divine miracle is to reject God's providential intervention on humanity's behalf. A divine miracle, Father Francis says elsewhere, is no less binding on Christians than God's Word.[58] Father Francis goes on to cite a number of recent miracles, many of which, he says, were attested by Protestants. His favorite recent miracle by far is the miracle of Calanda, Spain, in which the amputated leg of a young man was miraculously restored in 1640.[59] The miracle of Calanda, Father Francis says, evidently transcends all natural and angelic powers. Brought about in response to the Virgin's intercession, the miracle of Calanda "suffices abundantly to convert Atheists."[60] Father Francis also evokes the miraculous cure of John Trehil at St. Maddern's well in Cornwall in 1640, which was related to Charles I at Oxford when Charleton was in the king's entourage as royal physician.[61]

It becomes clear that Father Francis's treatise of philosophy is really aimed at empowering his English students to recognize the most recent divine miracles and invite others to recognize them. Going beyond Charleton's claim in *Darkness of Atheism* that God *could* in the future operate miracles, Father Francis implies that God has recently intervened with a spectacularly divine sign in order to save the present generation from atheism. Convinced that the age of miracles has not ended, the Catholic philosopher is called in a unique and urgent way to study natural causes, not only for the sake of contemplating God's creation in "The Book of Nature," as Boyle would have it,[62] but also for the sake of hearing God's living Word—granted that God's recent miracles confirm God's Revelation without adding to it. By working miracles, God manifests his providence for a Creation that contains both spiritual creatures

[58] Sancta Clara, *Religio philosophi peripatei discutienda,* 1662, 21: "miraculum est quoddam Dei verbum."

[59] *Paralipomena philosophica,* Cap. 4, 65. A full account of the miracle in Spanish is appended to the treatise.

[60] *Paralipomena philosophica,* Cap. 4, 47–48.

[61] *Paralipomena philosophica,* Cap. 4, 68.

[62] R. Boyle, *Works,* Vol. 13, 147–172, especially 163; "Nor do our Christian Authors speake improperly, when they call the World the Booke of Nature. For indeed in this vast Volume, the Spangled Sky may passe for the Blew and Gold Cover; the Elements, for Leaves; the Species of Mixts for Lines; the particular Mineralls Plants & Animalls for Words, & their Propertys for Letters."

and material creatures, which means that God's Creation is directed to supernatural beatitude as well as to natural beatitude.[63]

God's inexhaustible providence for spiritual beings brings us back, paradoxically, to material atoms and elements. Do elements convert into neighboring elements? The dynamic equilibrium of the universe is preserved, Father Francis argues, by the fact that neither elements in the vulgar sense of ambient air, earth, fire and water, nor the true elements that were formed by God at Creation, convert into one another.[64] From the start, Father Francis explains, God assigned quantitative boundaries to the ordinary elements.[65] Ordinary fire, air, water and earth do not "devour" one another. If more water is generated in one place, it is withdrawn from another. A fortiori, true elements do not increase or diminish.[66] Father Francis regards the stability of true elements to be a basic conservation principle.[67] True elements, as such, are not corrupted, altered or generated.[68] The doctrine that the cosmic quantity of air, fire, water and earth is fixed and that atomic elements cannot "diminish or increase," introduces a puzzle. Did God initially raise only a finite quantity of atoms to serve as seminal principles? If this is Father Francis's view, there must be atoms of *materia secunda* that are not endowed with "degrees of form." Are there? If so, what is their function?

Perhaps the answer is found in the final chapter, where the ladder of created forms, both material and spiritual, is discussed. Citing Scotus, Father Francis compares the *Scala mundi* to music: the universe is ordered harmonically, which is to say through consonance, which requires a full range of sounds, justly ordered and proportioned. If every sound were of the same pitch, there would not be order or beauty.[69] God's Creation must possess every degree of perfection, from the highest degree down to the least. Above the ladder of material forms, angels and immaterial souls are also ordered hierarchically.

[63] *Paralipomena philosophica,* 47: "Mirum igitur non est quod secundum hunc excellentiorem causatur nobiliorem ordinem nobis incognitum, proveniant effectus nobiliores quam natura mundi corporei attingere potest, quae miracula dicimus. Et hinc usui sunt, quod àposteriori demonstrant providentiam Dei supernaturalem, seu ordinem quendam esse supernaturalem, cui ordo naturalis causarum cedere debet."

[64] *Paralipomena philosophica,* Cap. 14, 188.

[65] *Paralipomena philosophica,* Cap. 14, 186; "Corpora illa quae censentur elementaria, suos ab initio determinatos districtus habuerunt, adeo ut alqiqui qui usque ad minutias haec examinant, iis gradus Mathematicos distribuunt, quos transgredi non possunt."

[66] *Paralipomena philosophica,* Cap. 14, 194: "Multo minus diminui vel augeri possunt *vera Elementa* in quibus penitior est effectus et intimior mundi ab illis dependentia."

[67] *Paralipomena philosophica,* Cap. 14, 189; "Ego igitur aliter statuerem modum conservandi universum, ex actionibus elementorum veorurm et vulgarium, sine mutua invasione."

[68] *Paralipomena philosophica,* Cap. 14, 187.

[69] On the subject of music, see Benjamin Wardhaugh, ed., *The compendium musicae of René Descartes: early English responses* (Turnhout: Brepols, 2013). Descartes's work was translated into English by Charleton (1653).

Rejecting Lucretius's doctrine that the human soul is composed of atoms, Father Francis affirms that the rational soul belongs to the spiritual hierarchy, as its lowest degree. Rather than admit a discontinuity, however, between the ladder of material forms and the ladder of spiritual forms, Father Francis argues that there is a special kind of substance that "intervenes" between material forms and immaterial forms. What is inserted — what indeed allows the *Scala mundi* to be a single uninterrupted ladder of forms — are "very tenuous spirits that quasi-glue the soul to the body." Father Francis speculates that these spirits are neither absolutely immaterial, like true spiritual things, nor corporeal. They are some sort of third genus, yet are *material absolutely speaking*.[70] These "extremely minute but extremely powerful entities," he says, are perhaps (*forte)* "extremely pure substances." Their function is to "bind together the whole spiritual and corporeal world." Reason, experience and the consensus of philosophers, Father Francis says, concur in postulating their existence.

Are these *minutissima sed potentissima entia,* which are material, but not corporeal, atoms of *materia secunda,* which is to say atoms "informed" immediately by God's own Spirit to be "dispositionally fluid"? Are they atoms of *materia secunda* enhanced with special adhesive powers? Are they "unsubordinated" atoms of *material secunda,* in which "fluidity" is not subordinated to corporeal principles? Leaving the riddle unanswered, Father Francis concludes by reiterating that nothing is left to chance in God's universe, where even the smallest and most minute creature is related to the highest and most spiritual through "concatenation" and harmony. The role of these *minutissima sed potentissima entia* in securing universal harmony is thus absolutely crucial, even though little information is given about them. Reminiscent of Descartes's subtle matter, they are postulated on the grounds of a metaphysical *plenum* rather than on the grounds of a spatial *plenum.* Do they imply a universal indeterminacy through which God intervenes to benefit spiritual creatures and through which spiritual creatures act freely to cooperate with God? Be this as it may, let us note that Robert Boyle was convinced that a divine intervention is needed every time a human soul is "attached" to a human fetus. Boyle argued that "there is no meerely [sic] Physical or Mechanical Agent that can make an intimate Union between two such different Beings."[71] Unlike Boyle, Father Francis was apparently willing to consider the possibility of a "Physical

[70] *Paralipomena philosophica,* Cap. 15, 203: "Dico igitur, quod ordo qui intervenit inter immaterialia et pure materialia, non est anima rationalis, quae simpliciter de genere immaterialium est; sed sunt spiritus tenues, qui quasi conglutinant animam ad corpus. Nec sunt simpliciter de genere pure spiritualium, vel immaterialium, nec certè corporalium, sed aliquod tertium genus, quod tamen simpliciter est materiale."

[71] Boyle Papers, 2:62; cited by J. J. MacIntosh, "Robert Boyle on Epicurean atheism and atomism," 209, ftn. 35.

Agent," or maybe a "semi-Physical" agent, by supposing a very "pure" class of atoms with a positively indeterminate essence.

Two conclusions may be drawn. First, in a philosophical treatise that was approved by religious censors and designed to initiate English students into recent advances in natural philosophy so as to empower them to discuss miracles intelligently, Franciscus à Sancta Clara did more than remove religious obstacles against Epicurean atoms. He showed that a corpuscular theory of matter is eminently suited to the Christian doctrine that God's Creation *ex nihilo* is guided continuously and in every detail by God's unfolding providence, including God's providence for spiritual creatures, who are destined for God's presence. Secondly, Sancta Clara was not in search of a philosophical master whose disciple he would become. Rather, he pursued a piecemeal approach, seeking to uncover overlapping views and convergent positions. Without discarding Aristotle's definitions, he showed that a corpuscularian theory of matter tracing back to Epicurus could be substituted for "pure potentiality" on sound grounds and with no ill effects. Like Boyle, he emphasized that atomic effluvia constituted a good replacement for occult forces as well as for Aristotelian powers. Like Charleton, Sancta Clara emphasized God's power as an efficient cause to argue that God could operate new miracles in a clockwork universe. Going beyond Charleton, he corroborated the claim empirically by invoking the recent Calanda miracle and gently challenging philosophers and medical doctors to explain it away. Could an amputated leg regenerate naturally? In 1652, Sancta Clara was working closely with Thomas White and Kenelm Digby to improve conditions for fellow Catholics in England.[72] Given the context, it seems that Sancta Clara hoped to reach out to philosophers such as Charleton and Boyle by combining corpuscularianism with citations from Scripture. He wished, perhaps, to remind them that an English Catholic priest and Franciscan friar, no less than Mersenne and Gassendi, could have a critical temper, an open-mind and a keen interest in the new physics — as well as a very special competence in safeguarding God's prerogatives.

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[72] Thomas White dedicated his 1652 *Institutionum scararum peripateticis inaedificatarum*, published in London, to Sancta Clara. Kenelm Digby and Sancta Clara, in turn, were both involved in negotiations with Cromwell held at Somerset House. See Dockery, *Christopher Davenport,* 125.

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Mysterious Mixtures: Descartes on Mind and Body

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Abstract: As is well known, Descartes' doctrine on the relations of mind and body involves at least the following two theses: (i) the real distinction of mind and body is compatible with their substantial union; and (ii) the siting of the mind at the tip of the pineal gland is compatible with its presence throughout the body. This essay seeks to perform three main tasks. One is to suggest that, so far as Descartes is concerned, the doctrine that arises out of the combination of (i) and (ii) blocks off the problems that are alleged to arise for mind-body interaction. A second is to illustrate how, in a certain vision of Descartes' thought, (i) and (ii) are more closely connected to each other than is generally explicitly recognised. And a third is to illustrate how one grade of mixture of stuff-types that the ancient Stoics envisaged both provides a model for answering Descartes' demands and has a reputable pedigree within the tradition to which he was heir.

Keywords: *Descartes; Stoic theory of mixture; mind and body; real distinction; substantial union; unio inconfusa.*

1. Introduction

Descartes' doctrine on the relations of mind and body involves at least the following four theses:

(ia) mind and body are really distinct;

(ib) in humans, mind and body form a substantial union;

(iia) the seat of the mind is at the tip of the pineal gland; and

(iib) the mind is present throughout the body.

These four theses imply, among other things, the following two:

(i) the real distinction of mind and body is compatible with their substantial union; and

(ii) the siting of the mind at the tip of the pineal gland is compatible with its presence throughout the body.

This essay seeks to perform three main tasks. One is to suggest that, so far as Descartes is concerned, the doctrine that arises out of the combination of (i) and (ii) simply blocks off the problems that are alleged to arise for mind-body interaction. A second is to illustrate how, in a certain vision of Descartes' thought, (i) and (ii) are more closely connected to each other than is generally explicitly recognised. And a third is to present a rather unsettling picture of what Descartes is up to in asserting all six theses, in particular in asserting (ia) and (ib) in such ways as to imply (i) and (iia) and (iib) in such ways as to imply (ii).

We begin by considering why Descartes warned some of his correspondents that we should expect there to be trouble about asserting some subsets of the theses that look most likely to cause problems of compatibility. He expected trouble; but he nevertheless, did assert them and was ready for the trouble asserting them causes. Then we examine some options relative to (ia) and (ib); if neither can be sacrificed, we need a model on which they turn out compatible. This will lead us into what might seem a digression into the grades of mixture of distinct stuffs. Though unsettling, one grade of mixture that the ancient Stoics envisaged both provides a model answering Descartes' demands and has a reputable pedigree within the tradition to which he was heir. It will then be seen that the derivation of the model on which (i) comes out true also provides the resources for understanding how Descartes could take (ii) to be true as well. That is to say, the unsettling picture that underlies (i) can be used to throw light on some longstanding puzzles about (ii).

2. Dualism and interaction

Hardly anyone has ever been satisfied with Decartes' doctrine on mind and body, especially the conjunction of (ia) and (ib) in relation to the possibility of the interaction of mind and body. From his correspondents and earliest supporters down to most recent commentators, almost everyone who has had something to say about mind and body has sought to avoid regarding the conjunction of (ia) and (ib) as a solution to Descartes' problems. Those who have sought to oppose Descartes have regarded the conjunction of (ia) and (ib) as a fine case of incoherence and have treated it with 'deliberate abusiveness'[1]; but I shall say very little more about that uncharitable line. Those, on the other hand, who have regarded the conjunction as an interpretive and philosophical challenge have sought various ways of easing perceived difficulties in it. Because these more charitable ways of meeting this challenge have frequently led to one-sided accounts of what Descartes must 'sacrifice' in order to get out of the perceived difficulties[2], the hope is that, though each of the individual

[1] See G. Ryle, *The Concept of Mind*, Hutchinson, London, 1949, p. 17.

[2] See, most recently, G. Strawson, "Descartes and Elisabeth," *Times Literary Supplement*, 13 February 2015, N° 5837, p. 6, in which Strawson alleges that, in their discussion of the

passages may be familiar enough, it is useful to have in front of us a fair range of his reactions in various dialectical contexts.

Descartes does not seem to have perceived the perceived difficulties as difficulties. While he was still alive to respond to them, he responded to them with equanimity, seeming to fail or to refuse to see *cause* for dissatisfaction. Though others might be dissatisfied, that is a reason (for Descartes) for thinking that others do not understand Descartes' doctrine. At most, he seeks to redress balance among the parts of his doctrine, when he feels that one conjunct has been emphasised at the expense of the other. He allows that the facts that give rise to the perceived difficulties are facts, but denies that the difficulties are anything more than perceived.

First, we consider how Descartes conducts himself when he is responding to criticisms levelled by his philosophical rivals, the atomists. In his reply of August 1641 to Hyperaspistes' contention that it is hard to understand the relation between incorporeal mental operations and corporeal traces (*vestigia*) in the brain,[3] Descartes makes one absolute and one comparative judgement about the perceived difficulty. The absolute judgement is that his view does not involve him in any difficulties:[4] though it is really distinct from the body, mind is nevertheless joined to it.[5] Comparative: this is no harder to understand than is the claim, common in scholastic theorising (*vulgo*), that real accidents act on a corporeal substance.[6] Descartes makes this comparative judgement to warn or reassure Hyperaspistes that a standard Epicurean attack on scholastic theories of substance and accident would be an inappropriate move against Cartesianism.

The same moves appear in Descartes' letter of 1646, notionally to Clerselier that, in the French edition of the *Meditations with Objections and Replies*, was meant to take the place of Gassendi's objections.[7] To the question of how the soul can receive the species or idea of corporeal objects,[8] he replies, first, that

mind–body problem, "Elisabeth trounces Descartes," though we shall see reason to think that, even if that were part of the story, it is hardly the whole story.

[3] Letter from Hyperaspistes, July 1641, AT III p. 400: "{*a*}*n igitur seu mentis operatio incorporea possit ulla sui vestigia corporea imprimere* [...*d*]*einde quomodo vestigia corporea cerebri nos ad incorpoream cogitationem deducent? Quomodo mens corporea illa vestigia speculari potest?*." At *DRN*, IV 87, the word "*vestigia*" seems to be a variant on Lucretius' words for a perceptible image ("*simulacrum*", "*effigium*" and "*imago*" being more common).

[4] Letter to Hyperaspistes, August 1641, CSMK p. 190; AT III p. 424: "[*n*]*ec in ullas plane salebras sententia haec conjicit*", where a "*salebra*" is literally a rocky place.

[5] Ibid.: "[...] *mens, realiter a corpore distincta, nihilominus ei conjuncta est*." The notion of joining will occupy us at length as we proceed.

[6] Ibid.: "[...] *non difficilius potest intelligi, quam vulgo intelligitur accidentia realia* [...] *in substantiam corpoream agere*."

[7] The parallel place of the *Fifth Replies* (CSM II p. 265; AT VII p. 387) takes a somewhat different tack.

[8] Letter for Clerselier, CSM II p. 275; AT IX–1 p. 213: "[...] *comment elle peut recevoir les espèces corporelles*"; citing from *Fifth Objections*, CSM II p. 234, AT VII p. 337: "[...] *quomodo existimes in te, subjecto inextenso, recipi posse speciem ideamve corporis, quod extensum est?*"

the alleged problem presupposes the explanation of the union of mind and body, which he has not yet discussed;[9] second, that it is an error to think that the fact that mind and body are substances of different natures stops them being able to act on each other;[10] and, third, that understanding how they can act on each other is no harder than understanding how an accident can act on a substance.[11] What is closest to our present concerns in these passages is that Descartes does not explain how mind and body interact, but calmly asserts the compatibility of their substantial union with their real distinction.

In response to philosophers of a more traditional bent who were also basically sympathetic to Cartesianism, Descartes drops the issue of accident-substance action. But his approach is not dissimilar. Commenting in April 1648 on a passage of *Meditations* VI that we shall return to, Burman asks how the soul can be affected by the body and vice versa, given that they are of very different natures.[12] Descartes' response is to admit that the explanation of this is a very difficult matter, but that experience suffices here for that makes it clear that there is no way of denying it.[13] What cannot be denied is that soul can be affected by body and vice versa, and that they are of very different natures.[14] Again, the move is to say that the real distinction must be compatible with interaction, whether we can explain it or not. Any explanation we might give of what cannot be denied will be more deniable than what experience tells us.

In July of the same year, Descartes takes exactly the same line in reply to Arnauld's observation that it is hard to understand how an incorporeal thing can push a corporeal one.[15] Descartes asserts that most certain and evident experience shows us everyday that this happens.[16] Not only does he deny that any reasoning

[9] Letter for Clerselier, CSM II p. 275; AT IX–1 p. 213: "[Gassendi's questions] *présupposent l'explication de l'union qui est entre l'âme et le corps, de laquelle je n'ai point encore traité*." Alquié notes in his edition (II p. 848) that some commentators, such as Laporte, have thought that this "*encore*" means that Descartes was intending to give an account of the union at some later date.

[10] Letter for Clerselier, CSM II p. 275; AT IX–1 p. 213: "[...] *une supposition qui est fausse* [...] *que l'âme et corps sont deux substances de diverse nature, cela les empêche de pouvoir agir l'une contre l'autre*."

[11] Letter for Clerselier, CSM II p. 275; AT IX–1 p. 213: "[...] *ceux qui admettent des accidents réels* [...] *ne doutent point que ces accidents puissent agir contre le corps; et toutefois il y a plus de différence entre eux* [...] *qu'il n'y a entre deux substances*."

[12] *Conversation with Burman*, CSMK p. 346; AT V p. 163: "[...] *quomodo anima affici potest a corpore et vicissim, cum sint diversæ plane naturæ?*."

[13] Ibid.: "[*h*]*oc explicatu difficillimum; sed sufficit hic experientia, quæ hic adeo clara est, ut negari nullo modo possit*."

[14] Indeed, in the "Synopsis" to the *Meditations*, he says that their natures are "*quodammodo contrariæ*" (AT VII p. 13).

[15] Letter from Arnauld, 25th July 1648, AT V p. 215: "[...] *vix intelligi possit, quomodo res incorporea corpoream possit impellere*."

[16] Letter to Arnauld, 29th July 1648, CSMK p. 358; AT V p. 222: "[...] *certissima et evidentissima experientia quotidie nobis ostendit*."

or analogy with other things should be sought here,[17] he claims that it is one of those things known of themselves that we obscure if we want to explain them in terms of something else.[18] The experienced interrelatedness of mind and body, as well as the distinctness of their natures, is just taken as primitive.

Third, there are correspondences in which Descartes is in rather more didactic mode. In January 1642, he writes advising Regius on how to conduct himself in the Utrecht controversy. He had just received from Regius the three corollaries that Voetius had had attached to the university's list of disputed matters, including the doctrine, attributed to Gorleus, that "man is a composite of soul and body and is a being and a unit accidentally and not of itself".[19] Because this doctrine was being associated with Regius and, hence, with Cartesianism, Descartes tells Regius that he should show, both in public and in private, that he believes that man is a *true being of itself and not accidentally*, and that the mind is really and substantially united to the body, not as a matter of place or disposition (as Regius has erroneously written).[20] The real and substantial union of mind and body is contrasted with what is easily taken to be a consequence of the real distinction, namely, the idea that the mind is in the body as a matter of place (it just happens to be there) or disposition (it just happens to fit). So, Descartes is asserting, for Regius' use and benefit, that to draw that consequence is an error. In the same passage, he also denies that there is any need for Regius to explain the true manner of substantial union because those who assert it in the way approved at Utrecht (*vulgo*) do not themselves explain it.[21] And, when he comes, a little further down, to examine Voetius' theses, he observes that many more people make the mistake of thinking that the mind is not really distinct from body than make the mistake of admitting their distinction and denying their substantial union.[22] That is, the view approved at Utrecht of the human being as a single substance has led many into denying, doubting or ignoring the real distinction between mind as a substance and body as a substance.

[17] Ibid.: "[...] *nulla quidem ratiocinatio vel comparatio ab aliis rebus petita*."

[18] Ibid.: "[...] *haec enima una ex rebus per se notis, quas, cum volumus per alias explicare, obscuramus*."

[19] Quoted in letter from Regius, 24th January 1642, AT V p. 487: "[*h*]*ominem ex anima et corpore compositum esse Ens et unum per accidens, non vero per se*."

[20] Letter to Regius, later January 1642, CSMK p. 206; AT III p. 493: "[...] *tam privatim quam publice, debes profiteri te credere hominem esse* verum ens per se, non autem per accidens*, et mentem corpori realiter et substantialiter essent unitam, non per situm aut dispositionem, ut habes in tuo ultimo scripto,*" emphasis original.

[21] Ibid.: "[...] *per verum modum unionis, qualem vulgo omnes admittunt, etsi nulli, qualis sit, explicant, nec ideo etiam teneris explicare*."

[22] Loc. cit., CSMK p. 209; AT III p. 508: "[...] *quoniam multo plures in eo errant, quod putent animam a corpore non distingui realiter, quam in eo quod admissa eius distinctione unionem substantialem negent*."

Likewise with his teacher's hat on, rather than fending off rivals or insinuating his orthodoxy, Descartes replies to Princess Elizabeth's gracious confession of slowness of wit in not being able to understand the idea by which we should judge how the soul, an unextended and immaterial thing, can move the body,[23] by appealing to the primitive notions, each known in its own way and not by comparison with each other, that we have of soul, of body and of their union.[24] After observing that metaphysics helps us to familiarise ourselves with the notion of mind, mathematics with that of matter, and ordinary life with the union of the two,[25] Descartes goes on to admit that it does not seem to him that the human wit (*esprit*) is capable of conceiving quite distinctly and at one go the distinction between the mind and body as well as their union.[26] This is a fact about what seem to be the limited capacities of the human wit for conceiving two things quite distinctly and at one go, because the two things seem to be in conflict with each other. But Descartes does not say to Elizabeth nor, so far as I know, to anyone else that the human wit is ultimately incapable of conceiving quite distinctly and at one go the real distinction and the substantial union of mind and body. Nor yet does he say that it is impossible (for some suitably subtle wit) to conceive quite distinctly and at one go the real distinction and the substantial union of mind and body. For he does not say to her, nor to anyone else, that the two things are in anything more than an apparent conflict given the powers of the human wit to conceive this or that.

If Descartes believed that the real distinction and the substantial union of mind and body were in conflict with each other, he might have explained to Elizabeth, or to someone else, that this conflict was the reason not only of why the human wit does not seem capable of conceiving them both quite distinctly and at one go, but also of why the human wit is not capable of doing so. But he does not do so. Even if the human wit really is not capable of this double and simultaneous act of conceiving, that is no reason for supposing that Descartes thought it cannot conceive quite distinctly the real distinction of mind and body, nor that it cannot conceive quite distinctly their substantial union. For, these are things that, often and energetically, he says we can conceive quite distinctly, even if we seem not to have the capacity for conceiving them quite distinctly and at one go.

[23] Letter from Elizabeth, 20th June 1643 (n.s.), AT III p. 684: "[...] *ma stupidité, de ne pouvoir comprendre l'idée par laquelle nous devons juger comment l'âme (non étendue et immatérielle) peut mouvoir le corps."*

[24] Letter to Elizabeth, 28th June 1643, CSMK p. 226; AT III p. 691: "[...] *notions primitives qui se connaissent chacune d'une façon particulière et non par comparaison de l'une à l'autre, à savoir la notion que nous avons de l'âme, celle du corps, et celle de l'union qui est entre l'âme et le corps*."

[25] Loc. cit., CSMK p. 227; AT III p. 692.

[26] Loc. cit., CSMK 227, AT III p. 693: "[...] *ne me semblant pas que l'esprit humain soit capable de concevoir bien distinctement et en même temps, la distinction d'entre l'âme et le corps, et leur union*."

The conjunction of the real distinction and the substantial union is the key to understanding the interaction of mind and body. Yet humans seem doomed to conceive of the two conjuncts as in conflict with each other: humans seem incapable of conceiving the two things at one go; and humans are strongly disposed to infer, wrongly, from each the negation of the other; most generally, people infer, wrongly, non-distinction from substantial union. But real distinction and substantial union cannot really be in conflict with each other, because each is a feature of the relation of mind to body and hence a key to understanding their interaction. The seeming incapacity of the human wit to conceive the relations of mind and body quite distinctly and at one go is not itself an obstacle to there being interaction between mind and body. It is at most an obstacle to humans' understanding it. So much the worse for us.

The foregoing suggests a position according to which Descartes is aware of why so many of his correspondents raise a problem about the interaction of mind and body. What he is aware of is the seeming incapacity of the human wit to conceive quite distinctly and at one go two things that seem to be in conflict, but that cannot really be so, because they are both true and each can be conceived quite distinctly on its own. If so, there is no need to absolve him, as some recent commentators have sought to do, of holding a position that we seem incapable of conceiving quite distinctly and at one go. There is no need to absolve him of holding such a position because we should not determine merely on the basis of its seeming to be impossible for the human wit, or of its actually being hard for the human wit, to conceive distinctly and at one go, that there need be anything wrong with holding such a position.

One way which has been tried to absolve Descartes of holding such a position, though we do not have good reason for ruling it out, would be chronological. Thus, Stephen Voss develops an account according to which, prior to 1642, Descartes would have said that the union of mind and body make man one thing and, after 1643, he "ceases to regard man as an *ens* at all".[27] But, though they all come from the last (most active) decade of Descartes' life, the snippets of correspondence we have cited above cut across Voss's chronological divide: if they represent a coherent position, albeit one that it seems difficult for the human wit to conceive distinctly and all at one go, there is no need to find here a development in Descartes' views. Nor does it seem necessary either to reduce the perceived tension, as Vere Chappell does, by attributing to Descartes a 'soft' or 'weak' version of the union, even if that means that we have to reinterpret the *Meditations* in the light of passages like those cited;[28] or to seek, in the opposite

[27] S. Voss, "Descartes: The End of Anthroplogy," in J. Cottingham (ed.) *Reason, Will and Sensation*, Oxford University Press, 1994, pp. 272–306 at p. 300. I do not claim to have done justice to all of Voss' collection of the relevant texts (pp. 301–6); for all that it is rather tendentiously catalogued, his listing offers an invaluable summary of the materials to be reconciled.

[28] V. Chappell, "L'Homme Cartésien," in J.-M. Beyssade, J.-L. Marion (eds) *Descartes: Objecter et Répondre*, Presses Universitaires de France, Paris, 1994, pp. 403–26, e.g. at p. 408: "Descartes n'a jamais eu l'intention de professer autre chose que l'unitarisme doux."

direction, to soften or weaken the role of the real distinction and thus stress the substantial union, as Paul Hoffman has ingeniously argued.[29]

Rather, we might try to explore a position that is hardly, if at all, understandable by the human wit (including mine).

3. Attached substances

Descartes' position has caused pretty general dissatisfaction because it is hardly, if at all, understandable. So we may join in the dissatisfaction. We might also remind ourselves why it seemed – at least to Descartes – the only option, and observe some of the characteristic ways he expresses it.

Relative to (ia) and (ib) enunciated above, there are four salient possibilities:

(a) No real distinction and no substantial union;

(b) No real distinction and substantial union;

(c) Real distinction and no substantial union; and

(d) Real distinction and substantial union;

where (d) is equivalent to (i) above.

Each of (a) - (d) could be elaborated in many ways.

For instance, (a) could emerge from any of a variety of types of substance monism, of the sorts that hold the apparent unity of the human being to be either accidental or in some way illusory. On the one hand, we might find strong forms of materialism or atomism that regard biology and psychology at best chance superveniences on the physical; if impressed, e.g., with the internal differentiation of the human body (regarding it as not unlike a coral reef, say) one might be led to an unwillingness to speculate about how the parts bond; and the same would go in spades for the relations of mental states to physical states. On the other hand, there is something reminiscent of Leibniz in the notion that the individual substances (monads) out of which matter appears to result are not in any sort of causal relation with each other, but nor are they of fundamentally different sorts.

It can be taken as read that such options would have no appeal for Descartes.

The view (b) that mind and body are not really distinct substances, but that a human being is a substantial union and a unit may be regarded as having been the consensus or default view at least in the universities of Descartes' day. We have already seen some traces of it in his uses of the word '*vulgo*' to mean the theorising of those who take the hylomorphic view that a human being is a substance in which the soul is the form, essence or actuality of the body. This view is encapsulated in the following influential passage from near the beginning of the second book of Aristotle's *On the Soul*:

[29] P. Hoffman, "The Unity of Descartes's Man," *Philosophical Review*, 95 (1986), pp. 339–70.

> Every natural body possessing life must be a substance of a sort that is compound (*sunthete*). But since it is a body of such a sort, namely a living one, the body cannot be soul, for the body is not <predicated> of a subject but instead is the subject and the matter. So the soul must be substance as the form of a natural body that has the power to be living. And substance in this sense is actuality. So the soul is the actuality of this sort of body.[30]

We have already seen in his answers to the Epicureans one reason why Descartes would reject this view: the action of one substance on another is less problematic than the action of an accident on a substance. There are also many others; some of the most prominent (but not necessarily convincing to modern ears) may be mentioned, without being rehearsed in detail: hylomorphism seems unable to give adequate accounts of introspection, of the separability or immortality of the soul, or of the numerical identity of minds (i.e. as substances). Thus, the Aristotelian view at best gives part of the story, though some of it might help for our conceiving distinctly the part that accounts for the union of mind and body.

The other partial position is (c). Because of Regius' exclusive stress on the real distinction, Descartes found that it was the position that Voetius and others were regarding as the Cartesian doctrine that a human being is an *ens per accidens*. As Arnauld puts it, Descartes' argument for the real distinction seems to prove too much and leads to the Platonic opinion according to which nothing bodily belongs to our essence, so that a man is just his soul and the body is nothing but the vehicle of the soul, when man is defined as a "soul using a body."[31] Though this is a view that has often erroneously been attributed to Descartes, Arnauld is alive to the fact that he rejects it,[32] and Descartes' rejection of it comes out absolutely clearly in his summarising, for Arnauld's benefit, a passage of *Meditations* VI[33] that he describes as dealing with the distinction of mind and body at the same time as proving the former to be substantially united to the latter.[34]

Relative to our present concerns, we can pinpoint one good reason why Descartes rejects (c). This is that it is probably vulnerable to the objection that it not only makes the interaction of mind and body seemingly beyond

[30] *De Anima,* II, i, 412 a 15–22.

[31] *Fourth Objections*, CSM II p. 143; AT VII p. 203: "[*a*]*ccedit quod hoc argumentum nimis probare videtur, et nos in eam Platonicam opinionem deducere* [...]*, nihil corporeum ad nostram essentiam pertinere, ita ut homo sit solus animus, corpus vero non nisi vehiculum animi; unde hominem definiunt*; Animum utentem corpore;" cf. the more guarded attribution to "*quelques Platoniciens*" at AT IXA p. 158.

[32] Ibid., restoring the excised passage from last note: "*(quam tamen Auctor refellit)*."

[33] I.e. *Meditations* VI, CSM II p. 56; AT VII p. 81, already referred to in connection with Burman and of which more below.

[34] *Fourth Replies*, CSM II p. 160; AT VII pp. 227–8: "[...] *in eadem sexta Meditatione, in qua egi de distinctione mentis a corpore, simul etiam probavi substantialiter illi esse unitam*."

humans' capacity to understand, but actually makes it incoherent: if there is nothing that holds them together, how can they interact? Thus, Descartes rejects what is often supposed to be a weak point in a doctrine that his objectors think of as Cartesianism for just the sort of reason that they think that it is weak: namely that it does not leave room for the interaction that daily experience familiarises us with.

Which, by exclusion of what seem to be the basic options in this game, leaves Descartes with (d).

Granting that (a) is excluded from the word go, and supposing that, from before 1641 to the end of his life, Descartes accepted at full force both the conjuncts of (d), one way of coming at what is going on here is to consider (d) as the conjunction of the positive bits of (Aristotelian) substantial union and of (Platonic) real distinction. Suppose, that is, that what makes (b) attractive is that it renders an adequate sense of the human being as a union and that what makes (c) attractive is that it properly observes the distinctness of mind and body. Suppose also that, at least taken separately, the attractive bits of these doctrines can be conceived quite distinctly. Can, then, (d) not be understood as getting what is right in (b) and (c) while rejecting the overall error of (a)? Of course, this is not in itself an argument in favour of (d). But we have already heard Descartes indicating to Regius that the negative bits of (b) and (c) (especially the former, Platonism being an option taken up only by those fairly rare birds, philosophers) are mistakenly thought to follow from the positive bits, and to Elizabeth that this is a mistake arising out of what the human wit seems incapable of conceiving quite distinctly and at one go.

Let us, therefore, reconsider the terms in which Descartes expresses the relation that involves both real distinction and substantial union.

First negatively. In *Discourse* V, he says that it is insufficient that the rational soul be lodged in the body as a pilot is in his ship.[35] The insufficiency in question is that, being lodged in this way in the body might account for how the mind moves it, but it cannot account for the reverse: how the mind undergoes the changes of the body. As Étienne Gilson notes, this is a traditional scholastic objection to the Platonic view, roughly our (c).[36] Rather, Descartes says that the rational soul needs to be more closely joined and united to it for it to have feelings and appetites like ours.[37] This is a line of thought on which

[35] *Discourse* V, CSM I p. 141; AT VI p. 59: "[...] *il ne suffit pas qu'elle* [sc. *l'âme raisonnable*] *soit logée dans le corps humain, ainsi qu'un pilote en son navire*."

[36] É. Gilson, *Discours de la Méthode, Texte et Commentaire*, [1925] Vrin, Paris, 1976, p. 431; Gilson refers us to St Thomas, *On the Creation of Spirits*, I, 2 and *Summa Contra Gentiles*, II, 57 and (in his *Index Scholastico–Cartésien* [1913], Vrin, Paris, 1979, text 462) to the Coimbra Commentary on *On the Soul*.

[37] *Discourse* V, CSM I p. 141; AT VI p. 59: "[...] *il est besoin qu'elle* {sc. *l'âme raisonnable*} *soit jointe et unie plus étroitement avec lui* {sc. *le corps humain*} *pour avoir* [...] *des sentiments et des appétits semblables aux nôtres*." Again, the joint is the name of our problem.

we hear variations, as the relation recurs in other places, such as the passage of *Meditations* VI already twice heralded in connection with Burman and Arnauld. Here, Descartes says that nature teaches him, by the feelings of pain, hunger, thirst and so on, that he is not in his body as a sailor is in his ship[38]. Here, what nature teaches him is similar to what he says to Elizabeth about ordinary life familiarising us with the union of mind and body. And, as Marleen Rozemond has set out in detail, the underlying thought here is that Descartes "defends the substantial union of mind and body on the basis of sensation."[39]

Descartes' claim that there is a disanalogy between the sailor-ship relation and the mind-body relation may be spelt out, first, by coping with an objection to it and, second, by seeing a further extension of it.

The objection, mooted for instance by Bernard Williams,[40] is that there may be cases in which the sailor relatum in a sailor-ship relation may nevertheless be so closely joined and united to the ship relatum as to account for something that should be counted as feelings felt *in* it. Thus, superficially, the driver of a car is lodged in it as a sailor is in a ship: we have two distinct substances, one is (said to be) a thinking thing and the other (the car, I suppose) not at all. But the claim might be that a driver who is very accustomed to her car can be said to feel, for instance, the misfiring of the pistons. The question is how literal a bit of saying this would be and what it carries with it. On the one hand, if we try to treat it as no counter-instance at all because purely metaphorical, we risk overlooking an important feature of some types of bodily habituation, to which we return in considering Descartes' understanding of the way, for instance, a luthier can have memory in his hands.[41] On the other, if we allow that this is indeed a case of 'a person feeling in her (car's) pistons', we are likely to be raising more questions than we can answer. Is this 'feeling in her pistons' really the same as my feeling something in my hand, or is it more like her feeling *that* the pistons are misfiring from the feelings in her body? Or, which may be the same point, is there a level of piston misfiring which will cause pain—to the driver or to the driver-car compound—in the way that nerve firings in my hand will?

Whichever line we take as regards the example of the car, more intimate levels of sailor-ship relations might be proposed to accentuate the difficulty, perhaps by reference to the bodily experiences of cyborgs and the like. In each such case, the problem will be that of identifying the border between the sailor

[38] *Meditations* VI, CSM II p. 56; AT VII p. 81: "[*d*]*ocet etiam natura, per istos sensus doloris, famis, sitis etc., me non tantum adesse eo corpore ut nauta adest navigio*." Perhaps the French of the *Meditations* (AT IXA p. 64), is following the original choice of words from the *Discourse* just cited in speaking of a pilot rather than a sailor.

[39] M. Rozemond, *Descartes's Dualism*, Harvard University Press, 1998, p. 213.

[40] B. Williams, *Descartes: the Project of Pure Enquiry*, Penguin, Harmondsworth, 1978, p. 279 n. 3.

[41] See letter to Meysonnier, January 1640, CSMK p. 144; AT III p. 21.

relatum and the ship relatum. But Descartes' claim has got to be that, when we are dealing with an embodied mind or an enminded body, that border is erased.

The case that extends the sailor-ship analogy is presented in the letter to Regius of January 1642 already cited. There, in the place of a human mind as the sailor relatum, Descartes appeals to what would happen if an angel were present in a human body. Here, he is depending on the orthodox idea that an angel is a purely intellectual being[42] and has no body to which it is naturally united,[43] because an intellectual substance that is not united to a body is more perfect than one that is.[44] This implies in turn that it is at best by analogy that an angel can be said to have sensation.[45] That is, if an angel were in the sailor position relative to the ship of the body, Descartes says that it would not have feeling as we do, but would only perceive motions.[46] This is because the intellectual being that is an angel is not 'apt' for union with the body in the way that a human soul is.[47]

Further developing what is denied when Descartes denies that a mind is in a body as a sailor is in a ship, there is a cluster of images by means of which he gives a developmental account of the relation of mind to body in human beings. Roughly speaking, what happens is that, when a person is conceived,[48] her rational faculties are subordinated to the mechanisms of the body and it is only later that the mind can take control. The natural history of human beings is one in which the real distinction can be made by each individual only after the brutal business of getting through childhood is over. The anthropology involved serves also to explain why

[42] See St Thomas, *ST*, I, 54, art 3, ad 1: "[...] *angelus dicitur* intellectus *et* mens*, quia tota eius cognitio est intellectualis*."

[43] See St Thomas, *ST*, I, 51, art. 1: "[*R*]*ESPONDEO dicendum quod angeli non habent corpora sibi naturaliter unita*."

[44] Ibid., ad 3: "[...] *substantia intellectualis quæ non est unita corpori, est perfectior quam ea quæ est corpori unita*."

[45] St Thomas, *ST*, I, 54, art 5 *ad 1–2*: [e]xperientia *vero in angelis attribui potest per similitudinem cognitorum, et non per similitudinem virtutis cognoscitivæ*." This is a joint reply to the positions of Augustine and Isidore.

[46] Letter to Regius, January 1642, CSMK p. 206; AT III p. 493: [...] *non sentiret ut nos, sed tantum perciperet motus*." This disposes once and for all of the (admittedly, only half–serious) caricature of Descartes' position offered by C.D. Broad as "a Thomistic angel doomed for a time to haunt a penny–in–the–slot machine' (see his "The New Philosophy from Bruno to Descartes" [1944] reprinted in his *Ethics and the History of Philosophy*, Routledge and Kegan Paul, London, 1952, p. 152) and the unjustly more famous Rylean tag, "The Ghost in the Machine," in *The Concept of Mind*, cit.

[47] See letter to Arnauld, 29th July 1648, CSMK p. 358; AT V p. 223: "[...] *mens etiam corporea dici potest, quatenus apta corpori uniri*."

[48] In *Sixth Replies*, Descartes rather ducks the issue of the derivation of a child's soul (ad 3, CSM II p. 287; AT VII p. 425), but there is some reason, to which we shall return, for attributing to him the view that each soul is a fresh creation.

Descartes' treatise on *Man* could cover so much ground without making further reference to the soul than what we find in its first paragraph.[49]

In *Discourse* II, Descartes says that, as children, we had to be governed for a long time by our appetites,[50] where, for the reverse of the reasons given about sailors in ships or angels in human bodies, our appetites are features of the body. We had to be governed by these bodily impulses on pain of death: a child that responds to hunger by doing the noisy things, such as mewling, that procure food increases its chances of surviving; one that does not does not. Though we may later learn—for instance from the considerations about divine benevolence in *Meditations* VI[51]—that it was better for us to follow these promptings than not, because, on the whole, they lead to the avoidance of worse, that knowledge is not available to us when we are children. Children do not have this knowledge because they have very little, if any, knowledge whatever.

In children, it is not the mind but the body that governs both behaviour and belief. This explains why children's behaviour is so undirected. Descartes suggests that a child's body is like the body of a person who has drunk wine: it is an impediment to action.[52] But it is as regards belief that the dominance of the body over the mind has the most systematic effect. For, as he says in *Sixth Replies*, because a child makes less good use of its bodily (i.e. sensory) organs, it thinks about nothing other than what comes to it from them and to that extent takes notice only of confused things.[53] As a child I had the habit of attending to the inputs of the senses which, as we learn in *Meditations* I, could all have been fantastications planted on me by a malicious demon. This habit is hard for me to break, except by an effort of the will,[54] but it has already done its work in rendering me like a slave who does not wish to wake from my dreams.[55] Yet, as I grew up, my mind was no longer totally enslaved to the body.[56] Implication: previously it was.

[49] *Man*, CSM I p. 99; AT XI p. 119–20.

[50] *Discourse* II, CSM I p. 117; AT VI p. 13: "[...] *il nous a fallu longtemps être gouvernés par nos appétits*."

[51] I.e. *Meditations* VI, CSM II p. 61; AT VII pp. 88–9.

[52] *Fifth Replies*, CSM II p. 245; AT VII p. 354: "[...] *non tam perfecte* [sc. *mens*] *agat in corpore infantis quam adulti, ac sæpe a vino aliisque rebus corporeis ejus actiones possint impediri*."

[53] *Sixth Replies*, CSM II p. 297; AT VII p. 441: "[*c*]*umque mens, illa aetate, minus recte organis corporeis uteretur* [...]*, nihil absque ipsis cogitaret, res tantum confusas advertebat*."

[54] *Meditations* I, CSM II p. 15; AT VII p. 22: [...] *non male ag*{*o*}*, si, voluntate in plane in contrarium versa* [...]." The vocabulary of habituation is strong in the surrounding passage (AT VII pp. 22–3): "*recurrunt consuetæ opiniones*", "*confidere desuescam*", "*prava consuetudo judicium meum e recta rerum perceptione detorqueat*", "*desidia quædam ad consuetudinem vitæ me reducit*", as well as two occurences of "*credulitas*" as the name of the habit in question.

[55] Ibid., CSM II p. 15 ("prisoner"); AT VII p. 23 ("*captivus*"); AT IX–1 p. 18 ("*esclave*").

[56] See, e.g. *Principles* I, 72, CSM I p. 219; AT VIII–1 p. 36: "[…] *notre iam annis maturis, cum mens non amplius tota corpori servit;*" AT IX–2 p. 60: [...] *notre âme, n'étant plus sujette au corps*."

Descartes indicates what he thinks happens when one grows up so that one's mind can take control. When Arnauld asks him about the mental powers of infants in the womb,[57] Descartes responds that the trouble is that their minds are attached to a brain that is excessively wet and soft.[58] Though this is in some respects a gesture at longstanding theories in embryology,[59] there is at least one other respect in which it fits a pattern of Descartes' viewing the body as obstructing the mind because the former permeates the latter.

The imagery here of the body as liquid might seem a perverse way of picturing what is often thought of as too, too solid. But it is certainly the way that Descartes talks, for instance, in the *Principles*. At I 47 and 71, he uses the adjective "*immersus*" for the relation between the mind and the body of a child,[60] and the vocabulary returns in the *Conversation* with Burman.[61] Likewise, near the end of *Principles* I, 71, Descartes uses the word "*imbutus,*" which means something like drenched or soaked,[62] to explain the way that our childhood habits have left us with so many beliefs that will not withstand scrutiny. One thing can be immersed in another only if what it is immersed in is pictured as a liquid. Though this is only imagery, the picture that emerges presumably carries with it the idea that a body that is in this way childish resists control, and that the mind is somehow dispersed in it and thus incapable of concerted action. That is, the childish body resists control in a passive, elusive way as any liquid does: there is no handle to get hold of.

What differentiates the relation between the mind and the body in an adult from that in a child is that, in the adult, the mind can take control of the body. We might expect that this change comes about because the mind acquires new characteristics, what we would think of as a mental growth culminating in arrival at the age of reason.[63] But the idea of the childish body as unmanageable because

[57] Letter of 20th July 1648, AT V p. 213.

[58] Letter to Arnauld, 29th July 1648, CSMK p. 356; AT V p. 219: "[sc. *Mens*] *alligata est cerebro nimis humido et molli*."

[59] For instance in the twenty–second chapter of the Hippocratic treatise on "The Nature of the Child," the writer offers an extended account of hydroponics as an analogy of an embryo's growth *in utero*. Nevertheless, there are places in which Aristotle asserts that what is dry is furthest from what has soul (e.g. *Generation of Animals*, II i, 733 a 11ff.): a fear of deserts as infertile or half a nod at Thales?

[60] *Principles* I, 47 (CSM I p. 208; AT VIII–1 p. 22) and 71 (CSM I p. 219; AT VIII–1 p. 36) for both these occurrences CSM gives "immersed" and Picot the less telling "*offusqué*" (AT IX–2 pp. 42 and 59 respectively).

[61] *Conversation*, CSMK p. 336 ("swamped"); AT V p. 150.

[62] *Principles* I, 71, CSM I p. 219 ("swamped"); AT VIII–1 p. 36; again, Picot suppresses the image: "*un temps que nous n'étions pas capables de bien juger*" (AT IX–2 p. 59).

[63] This would be the line suggested, e.g. by the reference towards the end of *Discourse* II in which Descartes says that he would wait until he was more mature than the age of twenty–three (CSM I p. 122; AT VI p. 22), where we would expect the maturity in question to be an intellectual state.

fluid would indicate the opposite: the mind need not change so long as the body dries out sufficiently to become manipulable. It may, of course, be that both parties undergo change: the mind becomes freer and the body becomes less soggy.

Both in the child and in the adult, Descartes takes the union of the mind and the body to be at least as strong as the composition that makes Aristotle's living being one single thing. What we are aiming to elucidate is what this union amounts to. For, some of his vocabulary might put us in mind of the human being as a sort of ensemble, when for instance he speaks of the mind as closely tied to the body,[64] stuck to it,[65] or joined to it without mediation.[66] These ways of speaking might give the unfortunate impression that the union that he has in mind is the union that we might find in a bundle or in an artefact of some sort. What would make this impression unfortunate is that it might downplay the respect in which the tying or sticking or joining is not, so to speak, extrinsic. Rather, the union has to be both intimate and mutual.

When, in *Principles* I 60, Descartes is setting up his terminology of the types of distinction that can hold among things, he begins with the real distinction and gives as an (the?) example that of the relation between a certain thinking substance and the bodily substance to which it is closely connected.[67] For the purpose of specifying the real distinction, this relation is explained as being so close that they could be no more closely joined,[68] in such a way that even though a single (composite) something comes out of the two things, they nevertheless remain really distinct.[69] In this passage, Descartes is clearly taking up the terminology already used in *Meditations* VI to explain the respect in which he is not in his body as a sailor is in a ship. There, he says that he is very closely conjoined to his body and virtually ('*quasi*') mixed with it,

[64] E.g. *Principles* I 71, CSM I p. 218; AT VIII–1 p. 35 ("*mens nostra [...] arcte corpori erat alligata*"); AT IX–2 p. 58 ("*notre âme était* [...] *étroitement liée au corps*"); likewise letter to Arnauld, 29th July 1648, CSMK p. 356; AT V p. 219, cited above note 58.

[65] E.g. *Principles* I 71, CSM I p. 219 ("attached"); AT VIII–1 p. 35 ("*adhærens*"); AT IX–2 p. 58 ("*étroitement unie*"); likewise *Sixth Replies*, CSM II p. 297 ("attached") AT VII p. 441 ("*affixa*"); AT IX–1 p. 239 ("*attaché*").

[66] E.g. letter to Mersenne, 30th July 1640, CSMK p. 149 ("immediately joined"); AT III p. 124 ("*immédiatement joint*").

[67] *Principles* I 60, CSM I p. 213; AT VIII–1 p. 29 "[*supponamus*] *Deum alicui tali substantiæ cogitanti substantiam aliquam corpoream* [...] *arcte conjunxisse*"; AT IX–2 p. 51: [...] *Dieu même joindrait* [...] *étroitement un corps à une âme*."

[68] Ibid., AT VIII–1 p.29: "[...] *ut arctius jungi non possint*"; AT IX–2 p. 51: "[...] *qu'il fût impossible de les unir davantage*," though one might have expected Picot to use "*joindre*."

[69] Ibid., AT VIII–1 p.29: "[...] *ita ex illis duabus unum quid conflavisse, manent nihilominus realiter distinctæ*," where "*distinctæ*" agrees with "*substantiæ*" and "*conflo*" has among its overtones both gathering and liquefaction; AT IX–2 p. 51: "[...] *ferait un composé de ces deux substances ainsi unies, nous concevons aussi qu'elles demeuraient toutes deux réellement distinctes, nonobstant cette union*."

in such a way as to compose a single something with it.[70] And, to bridge the chronological gap between the time of composition of the *Meditations* and that of the *Principles*, we may also note that the terminology of mixture appears also in the letter to Hyperaspistes: there he says that the union of mind and body is virtually or as if by ("*quasi*") a mixing.[71]

As Rozemond has rightly remarked, "Descartes himself never calls the mind-body composite a substance, even though there are several occasions on which his doing so would have been a most appropriate means of placating his opponents."[72] The single something that results from the mixture of mind and body may not have full title to be called a substance for one good reason and for one that is not so good. The good reason is that just advertised, namely that, if the composite were a substance, then it would pose difficulties for application of the real distinction without generating the incoherence that a human being is both one substance and two substances. But those difficulties arise from the uses of the word "substance" as a term of art both in Descartes' thought and in the scholastic tradition. Which leads to the less good reason. This would be shyness about using the word "substance" of a thing that was in some interesting way less than purely this or purely that. The shyness about saying that a thing that is neither purely one sort of thing (e.g. extended) nor purely another (e.g. thinking) is a substance is a shyness about saying that the result of mixing substances is itself a substance. What makes this shyness a less than good reason for avoiding the use of the word 'substance' for the resulting compound is the fact that we still have to see what grades and varieties of mixture should be taken into account.

The next section describes a sequence of grades and varieties of mixture that culminates in a type that locates Descartes' description, in *Sixth Replies*, of how he understands the way that the mind is coextensive with the body, all of the former being in all of the latter and all of the former being in each part of the latter,[73] which is a matter to which we shall return in the section after. To recapitulate: we have seen that Descartes has no option nor desire other than to maintain both the substantial union and the real distinction of mind and body, and that, to present his doctrine, he proposes a variety of images, both negative and positive, of the relation that aim do justice to its parts,

[70] *Meditations* VI, CSM I p. 56; AT VII p. 81: "[*natura docet me*] *illi arctissime esse conjunctum et quasi permixtum, adeo ut unum quid cum illo componam*" AT IX–1 p. 64: "[*la nature m'ensiegne*] *que je lui suis conjoint très étroitement et tellement confondu et mêlé, que je compose un seul tout avec lui*."

[71] Letter to Hyperaspistes, August 1641, CSMK p. 190; AT III p. 424: "[*ideæ*] *quæ est ista unione ac quasi permixtione oriuntur*."

[72] M. Rozemond, *Descartes's Dualism*, cit., p. 213.

[73] *Sixth Replies*, CSM II p. 298; AT VII p. 442: "[*n*]*ec sane iam mente alia ratione corpori extensam, totamque in toto, et totam in qualibet eius parte esse intelligo*"; AT IX–1 p. 240: "[...] *certes je ne conçois point encore aujourd'hui que l'esprit soit autrement étendu dans le corps, lorsque je le conçois être tout entier dans tout, et tout entier dans chaque partie*."

granting the while that the position as a whole seems to be beyond the powers of (my) human wit to conceive distinctly and at one go.

4. Degrees of mixture

Some of the distinctions of types of mixture are already made for us in the theories that the ancient Stoics developed and of which we have sufficient reports to outline a rough scale of degrees of involvement.[74] First, we set out at least the terminology with some possible examples of the degrees in ascending order of what we have called intimacy and mutuality; then we sketch the transmission down to the time of Descartes (and beyond) of one variant of the most intimate sort of mixture; and, in the next section, we return to try to apply this variant mixture to Descartes doctrine of the relations of mind and body.

(a) Putting together

Reporting Chrysippus' theory in his *De Mixtione,*[75] Alexander of Aphrodisias offers as an instance of mixture by juxtaposition (*kata parathesin*) the result of putting together beans and grains of wheat.[76] In this misguided form of muesli, each of the elements is in mere surface contact with the others. Though the resulting composite (*sunthesis*[77] or *parathesis*) is not just beans or just grains of wheat, its parts are still outlined by their own borders (*kata perigraphen*). Still, for the purposes of breakfast, I may treat it as a single stuff and, from a distance, it may look homogeneous, though it is not so on even cursory closer inspection: I can see the beans as beans and the wheat as wheat.

Getting a composite like what results from placing beans and grains together should be distinguished from two other operations in which the components are pretty visibly separable.

One is the creation of contiguous structures, of which, at *Naturales Quæstiones* II 2, Seneca gives a chain or a ship as examples.[78] In such a case, there

[74] References in this section are to S. Sambursky's classic study *The Physics of the Stoics*, Princeton University Press, 1959 (referred to as "Sambursky" by page); to the texts, translations and notes in Long and Sedley (eds) *The Hellenistic Philosophers*, (2 vols) Cambridge University Press, 1987 (referred to as "LS," by their numbering, with line or section numbers); and to the single–volume anastatic reprint of von Arnim's *Stoicorum Veterum Fragmenta*, (1903–5), R. Radice (ed.) Milan, Rusconi, 1998 (referred to as "*SVF*," by original volume, fragment and line numbering, and reprint page in case of doubt).

[75] Cited by Sambursky, p. 13n. 68, translated at pp. 121–2; LS, 48C, ll. 3 – 9; *SVF*, II, 473, ll. 10–3.

[76] Also Stobæus, *Eclogues*, 153, *SVF*, II, 471 l. 4; and Philo, *De Confusione Linguarum*, 184; *SVF*, II, 472, l. 30. At *Generation and Corruption*, I x, 328 a 2–3, Aristotle cites the slightly more palatable coupling of barley and wheat.

[77] Cf. Aristotle's term at *De Anima* II i, cited above n. 30.

[78] Cited by Sambursky at p. 8 n. 47.

is more than mere juxtaposition that holds the parts together; the word that Seneca uses is "*nexus*"[79] which corresponds to the Greek "*mixis*", and which it is well, for reasons that will become apparent, to call "simple *mixis*". Here, the joining is of a mechanical order, where the elements are made one by being forced together.[80] In many cases, such a putting together is a matter of subserving a purpose, though the parts are by nature divided and independent.[81] In the passage of Alexander already cited, this extends not merely to artefacts but also to such things as two vines that are so entangled (*emplekomenai*) as to give support to each other.[82]

On the other hand, the Stoics distinguish the joining (simple *mixis*) of solids or dry bodies from the mixing (simple *krasis*) that seems to involve characteristically liquids.[83] Both because it is not entirely perspicuous in itself and because it does not seem to have been uniformly observed,[84] we may take some liberties with its variants. And my first liberty is to separate two further sub-divisions of the mixing of liquids. The first we may call a suspension, and we distinguish it from a dilution.

To produce a suspension, we take oil and vinegar to make salad dressing. But they do not stay mixed of their own accord. They have to be forced by being agitated. To that extent, this sort of unstable mixture is not unlike that of muesli: the parts don't bond, but stay one on top of the other or, at best, in a temporary emulsion. Mustard powder helps to slow down the process of spontaneous separation in accordance with the different densities of oil and vinegar. But we should not suppose that the individual droplets of oil are anything other than dispersed through the vinegar: each droplet retains its own surface tension and is enclosed within itself (*kata perigraphen*).

So far in the gradation of types of mixture, we have relations between the stuffs mixed that do not make them go out of fully actual being. The grains of wheat and the beans are still grains of wheat and beans; the wood of a ship is still wood; and the oil and vinegar are still oil and vinegar. In each case, the stuffs that enter into these relations can be relatively easily recovered, by winnowing, dismantling and letting settle respectively. In these respects, what we have is a real distinction and no substantial union; i.e. our (b). The Stoics' distinctions among these types of mixture seem clear enough, and they attracted

[79] D. Vottero notes variant readings that include "*cognatio*" and "*compactio*" in his edition, *Questioni naturali*, UTET, Turin, 1989, p. 134.

[80] At *Letter to Lucilius*, 102.6, Seneca refers to similar cases: "[...] *diversæ partes iunctura in unum coactæ sunt;*" *SVF*, III, 160. Descartes' letters to Elizabeth of August and September 1645 took Seneca's *De Beata Vita* as their text and there are allusions to some of the letters to Lucilius; so it is not implausible that he was familiar with this passage.

[81] Loc. cit., "[*illi*] *officio cohærentes natura diducti et singuli sunt*."

[82] *De Mixtione*, translated in Sambursky, p. 122; edited out of LS 48C; *SVF*, II, 473 ll. 17–8.

[83] Sambursky, p. 13.

[84] See note to 48D in LS, II, p. 290.

much less attention than did dilution, which is what is said to happen when water is added to wine or vice-versa.

(b) Actualising mixture

What we may call dilution attracted attention because of what the Stoics ended up saying about it.

Let us begin with a relatively uncontroversial feature of it. This is found in a passage of Stobæus,[85] reporting that water-and-wine can be separated by dipping an oiled sponge into it. Supposedly, the water will be drawn up, but the wine not. Whether this is a correct description of what is going on or not, the idea behind it must be that the bond between the two liquids is not so very strong as to produce just one liquid because, adopting an Aristotelian lisp here, we can say that the mixture hardly resists the tendency of the watery parts to re-actualise themselves as such.

Nevertheless, the Stoic claim is that, in this sort of mixture, so long as it is unseparated, there is more than the sort of surface or forced contact that characterises muesli, a ship or salad dressing. This is an aspect of mixture that we might call through-and-through blending (*krasis di holon*).[86] And the distinctive Stoic claim is that, in through-and-through blending, two different substances can enter into an intercommunicating (*sumpathes*) through-and-through fusion (*sunchusis di holon*).[87] The physical realisation of this led to much perplexity among the critics of Stoicism concerning such issues as how the volumes of the blended liquids add up, what proportions determine the nature of the resultant blend,[88] and how the parts of the water and the wine are related.

With our sights on Descartes, we shall return in a moment to consider the last of these. But first it is useful to individuate at least three grades of fusion or blending, which may be assimilated by consideration of actual water and actual wine.

One grade of fusion is that presented by the making of a metallic alloy. Even under microphotography, hot-rolled brass presents a pretty homogeneous crystalline structure. Right down to the level of crystals, what we have is brass. Nevertheless, the crystalline lattice that endows brass with its

[85] *Eclogues*, I, 155, referred to by Sambursky, p. 11 n. 61 and translated at p. 123; LS, 48D; *SVF,* II, 471, ll. 21–3; a closely similar line of thought appears in Alexander, *De Mixtione,* 232, 1 and 233, 6, cited by Sambursky, p. 13 n. 66; also Philo, *De Confusione Linguarum*, 184, cited by Sambursky, p. 13 n. 64; *SVF*, II, 472, ll. 34–6.

[86] Diogenes Laertius, *Lives*, VII, 15, in LS, 48A; *SVF*, II, 479; also Plutarch, *De Communibus Notitiis*, ch 37 (1078e), cited by Sambursky, p. 13n. 67; in LS, 48B; *SVF*, II, 480.

[87] Sextus Empiricus, *Adversus Mathematicos*, VII, 234; another text we may be pretty sure Descartes had news of.

[88] For instance, Aristotle picks up what was presumably already a going *topos* in *Generation and Corruption*, I x, 328 a 25–33, and offers the idea that the two mixed substances are in some sort of competition for dominance.

characteristic properties is not to be found in either copper or zinc alone. The copper and zinc that constitute the brass do not through-and-through occupy the same places as each other. They remain copper and zinc in a solid solution, and can be recovered as such, for instance by heating to zinc's melting point, which is much lower than copper's. The respect in which, when melted, metals act as liquids but, when cooled, bond as solids is a reason for doubt about how deep the "*mixis-krasis"* distinction should be allowed to run: the solid-liquid distinction is, for some stuffs, relative to temperature or, as we have seen in considering the body of a child, perhaps to age.

Second, there is the case presented, for instance, by the making of bread. The water and flour (and other ingredients) go out of existence as water and flour in the baking and what comes into existence is through-and-through bread. This does not, of course, mean that, again putting an Aristotelian accent on it, the proximate matters of the water and the flour go out of existence. Rather, they become the proximate matter of the bread. Here, the Stoic view would be that the stuffs that were previously water and flour have come to pervade (*anapimplasthai*)[89] each other in such a way as no longer to be extricable. Once the bread is baked, the flour is unrecoverable as flour, because the ingredients have become confused and exist only as bread. The bread is a fusion (*sunchusis*)[90] of the ingredients, which have lost their own specfic characteristics.

Between these two cases, there is room for a third possibility. Namely that in which the two component stuffs are, like, the zinc and copper in brass, unconfused, but, like the flour and water in bread, united.

A case of this might be presented by the molecular bonding in, for instance, water. Though no ancient (Stoic or other) would have thought of water as a compound, we are allowed to by what we suppose we know about hydrogen and oxygen. But we have to do a bit of double-thinking. First, we pretend to forget what we are supposed to know about the chemistry of water. That is to say, we should try to regard is as an element, as a stuff that is through-and-through water. In pretending to forget that water is a compound, we are regarding it as having within it no real distinction among the stuffs that make it up. But, when we think of it as a compound, we regard it as a union that comes to be out of the interaction of oxygen and hydrogen. Now suppose, what is not so far from the truth, that hydrogen is very rarely found free on Earth and that almost always when it is found at all it is found in a union with oxygen, generally to form water or some combination of water with something else. If we then ignore the cases in which hydrogen is found either free or in some combination other than that which forms water, we can think of the water as at once through-and-through water, as a substantial union of hydrogen and oxygen, but also as involving a real distinction between the stuffs that make it up, even though one of those stuffs is such as only to occur in the union.

[89] Plutarch, *De Comunibus Notitiis*, 1078b; LS, 48E <1>; *SVF*, II, 465 l. 33.
[90] Philo, *De Confusione Linguarum*, 184; *SVF,* II, 472, ll. 39 (p. 153) – 5 (p. 154).

(c) Unconfused union

If there can be a complete union (*henosis di holon*)[91] in which there is both total pervasion, as in the case of bread, and yet in which the elements each persist as such, as in the case of an alloy, then we have a double mixture of distinct stuffs. On the Stoic model of fusion, in interacting so as to bring about water, the hydrogen and oxygen come to be mixed into one another (*anakraseos en allolois*) and to interpenetrate one another through-and-through (*antiparekteinesthai allelois d holon hola*). Unlike what we have been calling "simple *krasis*", we might think of this sort of blending as "double *krasis*". We have several attestations in the passages of Diogenes, Plutarch and Alexander already cited that the Stoics, and Chrysippus by name, held that this sort of complete union or double mixture holds of what we have already called the dilution of water in wine or vice versa. The distinctive claim is that a single drop of wine put in the sea will extend to fill the whole of it. When cashed out, this claim is that every part of the sea is both water and wine and every part of the wine is present throughout the sea. Which is formally analogous to the claim in *Sixth Replies* about the co-extensiveness of the mind with the body.[92]

It may be that Chrysippus put his claim about water and wine forward with some polemical intent.[93] In trying to find its source, we might think that we have here some sort of throw-back to, or development of, the theories that get attributed to Presocratic thinkers, such as perhaps Empedocles or Anaxagoras, to provide an account of how animals come to be out of what is not animal, on some supposition that somehow the whole of nature is shot through with all the elements out of which such complex things are made. Even if that were the genealogy of Chrysippus' claim—and it is beyond my competence to argue that it is—, we might still wonder why he makes it in such a shocking way. For it is hard to conceive that a single drop of wine should come to have the same extent as a whole sea, even a little one like the Mediterranean; it flies in the face of common sense.[94]

[91] Cf. Alexander, *De Mixtione*, translated at Sambursky p. 122, LS, 48C l. 41; *SVF*, II, 473, l. 19 (p. 155).

[92] *Sixth Replies*, CSM II p. 298; AT VII p. 442, cited above n. 73.

[93] Sambursky suggests Aristotle as the target (pp. 10–1); Sandbach (*Aristotle and the Stoics*, Proceedings of the Cambridge Philological Society supp. vol. 10 [1985]) rejects the suggestion (pp. 33–4).

[94] This is a point on which Plutarch (*De Communibus Notitiis*, 1077e, *SVF,* II, 465, 16), Simplicius (*In Arist. Phys.*, 590; *SVF*, II, 467, l. 41) and Themistius (*Paraphr. in Arist. Phys.,* IV 256; *SVF*, II, 468, l. 8) agree in thinking of as an affront to what the ancients have always thought. In the early 1990s, there was a flurry in the French press about an alleged discovery according to which the properties of some homœopathic compounds could be found in suspensions that the ordinary chemical distribution of the molecules could not account for. This was thought to be so much the worse for a thing called "science." It also turned out to be a nice case of fraud.

In a fairly recognisable way, the claim about the characteristics of a complete union is an indicator of how serious Chrysippus was in following through the consequences of his position. Saying that things are more intertwined than meets the eye lends itself to the use of such unexpected samples. Compare Chrysippus' claim with John Donne's statement of human sympathy, "any man's death diminishes me, because I am involved in Mankind"[95] or with M'Taggart's statement of cosmic sympathy, "the fall of a sand-castle on the English coast changes the nature of the Great Pyramid."[96] In this sort of way, Chrysippus is offering us a sample of his view that, even if we find it hard to take at face value, is a challenge to what we too easily take at face value: it is just the sort of challenge that is posed by the seeming incapacity of the human wit to conceive distinctly and at one go the real distinction of mind and body and their union.

The purpose of Chrysippus' taking such a stand can be elucidated when we recall that, in order to enter into causal relation with the body, the Stoic soul must be bodily.[97] Even if we do not believe what Chrysippus says about how water and wine can commune, we can see its application to the relation of body and soul. As Alexander reports:

> As clear evidence of this <sc. the wine drop extending to the whole sea> they <sc. the Stoics> appeal to the soul's own individual substance, just like that of the body that contains it, through and through pervading the whole of the body while preserving its own being in the mixture (*mixis*) with it, indeed no part of the body lacks a share in the soul.[98]

Is Chrysippus offering soul-and-body to convince us of the wine-and-sea? Is he using the wine-and-sea to convince us about soul-and-body? Or does he offer us both to insinuate the relation of the complete union of unconfused substances? From what Alexander says, it would seem that the direction of evidence is the first. From the frequency with which, as we have already seen, the wine-and-sea case is attested, it might seem the second. And, in addition to either or both of the others, perhaps also the last: if we can grasp either, we understand something about the other by coming to see something about a type of relation that can seem to be beyond the human wit to conceive distinctly and at one go.

[95] "Devotions on Emergent Occasions," Med. XVII in *Selected Prose*, (ed.) E. Simpson, Oxford University Press, 1967, p. 101.

[96] *The Nature of Existence*, (2 vols), Cambridge University Press, 1927, II pp. 11–2. I am grateful to Renford Bambrough and Robert Wardy for comments on an earlier attempt to deal with such shocking stuff.

[97] See Nemesius, *De Natura Hominis*, 81, 6 – 10; LS, 45D; *SVF,* II, 790.

[98] Alexander, *De Mixtione*, translated at Sambursky p. 122; LS, 48C <10>; *SVF*, II, 473 ll. 24–8.

Chrysippus' claim, then, is that two substances can form a union in which each occupies the same space as the other, indeed, each part of each interpenetrates every part of the other, and yet each remains a distinct substance. Whether or not we think that water and wine are appropriately adapted to each other to get this effect, it does seem to offer a model on which the soul can continue to be a distinct substance from the body and yet enter into a union with it. This model may be called the model of the "unconfused union": *asunchtos henosis* or "*unio inconfusa*." And it is a model that can be applied in various ways to different cases. For the Stoics, it is applied to the question of the composition of humans by finding an appropriate way in which breath can pervade a whole body. For Descartes, on the other hand, it involves the admission that there must be some respect in which the soul can be said to be corporeal insofar as it is apt to unite with the body. Which is precisely what we have already seen him writing to Arnauld in July 1648.[99]

(d) Transmission

Given the difficulty of understanding how Chrysippus supposed the water and wine to be related in unconfused union, it might be objected that this foray into a barely comprehensible bit of Stoic doctrine does not make a crux for Cartesianism any clearer. This is an allegation I have to own up to for the most part. In mitigation, I submit the outline of a reason for thinking that Stoic unconfused union is not, on that account, to be ignored. The reason is that it was not merely obscure to its detractors, but that it established itself among its subsequent supporters as an out-and-out and utterly respectable mystery.

In this direction, my first witness is the eclectic and anti-Christian Neoplatonist Porphyry of Tyre (233 - c. 305), whose *Various Questions*, a work now lost concerning the nature and composition of the soul, can be in part reconstructed from, primarily, the writings of the Christian Neoplatonist, Nemesius (*floruit* c. 390), whom we have already cited on Stoic soul doctrine.[100] Nemesius rejected the Stoic view, to which we shall return, that soul is a sort of body. Instead, he held that the soul is immortal in such a way as to ensure the resurrection of the body.[101] Nevertheless, he appears to have drawn from Porphyry a solution to the anthropological question of the unity of the human being. The solution invokes what we have seen as the Stoic notion

[99] Letter to Arnauld 29th July 1648, CSMK p. 358; AT V p. 223: "[...] *mens etiam corporea dici potest, quatenus est apta corpori uniri*," cited n. 47 above.

[100] See H. Dörrie, *Porphyrios'* Symmikta Zetemata*. Ihre Stellung in System und Geschichte des Neoplatonismus*, Munich, 1959, pp. 37–99. I am grateful to Giuseppe Girgenti for this reference.

[101] See I.P. Sheldon–Williams' chapters 28 and 31 in A.H. Armstrong (ed.) *The Cambridge History of Later Greek and Early Medieval Philosophy*, Cambridge University Press, 1967, specifically pp. 426 and 489.

of the unconfused union. The fact that Nemesius attributes this solution to Porphyry is my only ground for attributing it to Porphyry, and I admit that I do not know of any reason not to follow Nemesius.

My second witness in mitigation is St Augustine (354–430), who did not have direct access to Porphyry. But he did have indirect access, perhaps through Porphyry's Latin translator, Marius Victorinus (fourth century).[102] Drawing on this or some other intermediate source, St Augustine uses the unconfused union of the soul and body in man as an *a fortiori* argument in favour of the doctrine of the Incarnation of the two natures in Jesus Christ, as the Word made flesh, very God and very man.[103] Furthermore, still presumably under Porphyry's indirect influence, St Augustine applies the model of the *unio inconfusa* also to the analysis of the Trinity and to the triad essence-knowledge-love that he regards as the image of it in our minds.[104]

Third, another saint: Cyril of Alexandria (376–444) adopted the Augustinian account of the Incarnation and succeeded in imposing it at the first Council of Ephesus (June 431), subsequently reaffirmed at the Council of Chalcedon (451) as a doctrine that avoids two opposed heresies. These heresies were Eutychianism, which is the denial that Christ's body was genuinely human (and thus corresponds to our [b]), and Nestorianism, which was the denial that Christ was genuinely divine (and thus corresponds to our [c]).[105] The determination of Chalcedon, that Christ exists in two natures, became a point of faith held in common by Catholics and Orthodox alike (and, later, most Protestants). It is summarised in what has come to be known as the *Symbolum Athanasium*: "as rational soul and flesh is one man, so God and man is one Christ."[106]

The trouble, of course, is that a formula of this sort may not leave us any better off in understanding how a human being can be a substantial union of really distinct substances. Rather, it places that mystery on the same level as a doctrine about which "the most pious Christians of the present day are ignorant or careless of their own belief".[107] That is to say, Descartes' position on the nature of human beings, if we have located it aright, connects with a core doctrine of Christianity that everyone admits it is hard to conceive distinctly and at one go, precisely because it is not merely a mystery, but a Mystery.

[102] See *Confessions*, VIII, 2.

[103] For the attribution of the source–idea to Porphyry, *De Civitate Dei*, X 29; for doctrinal elaborations *De Trinitate*, I, 10, 20 and X, 7, 9; also *Letter to Volusanius*, 137, 3, 11.

[104] J. Pépin, "Une nouvelle source de Saint Augustin: le *zetema* de Porphyre sur l'union de l'âme et du corps," *Revue des Études Anciennes*, 66 (1964) pp. 53–107.

[105] St Thomas couches his solution to the question of the Incarnation in terms of the avoidance of these two heresies (which he identifies much more carefully than I have for present purposes) at *ST*, III, 2, art. 6.

[106] The formula "*sicut anima rationalis et caro unus est homo, sicut Deus et homo unus est Christus*" is variously attributable to St Ambrose, Vincent of Lérins or Cæsarius of Arles.

[107] E. Gibbon, *Decline and Fall of the Roman Empire*, (1776–8), ed. J.B. Bury, (7 vols) London, Methuen, 1896–1900, V p. 135.

5. The body as a whole

The Stoic doctrine, already alluded to, that the soul is in the body as a sort of pervading breath presents a number of important disanalogies from the uses to which the unconfused union was put in the Christian tradition and, as I am seeking to render plausible, in Descartes' doctrine of mind and body.

Perhaps the most significant disanalogy is that, where Stoic breath (*pneuma*) is itself a sort of body,[108] the analogue in Christological thought is regarded either as divine (and therefore non-material) or as of undefined status, and in Cartesianism its materiality is definitely excluded by a very familiar—if not entirely perspicuous—argument of which we find one formulation in *Meditations* II.[109] This is the argument in which Descartes refers to, with a view to excluding, theories of the soul as some sort of thin air infusing his limbs or a wind, fire, vapour or breath.[110] The ground of the exclusion is that each of these is a thing that he can suppose not to exist, but rather to have been imposed on him by a malicious demon. Though he admits that he does not know that his existence could not consist in something that he can suppose not to exist,[111] he proceeds to argue that his existence consists in something (a) that is other than his being these unknown things; and (b) that he can know; namely, (c) his being a thinking thing. And it is on this basis, by developing the real distinction, that he builds in *Meditations* VI to show that it is certain that no part of his soul is itself part of his body.[112]

One thought that this might give rise to is that, whereas the mixture of water and wine gives us some, as it were chemical, sense of what the Stoics were claiming about the interrelation between soul and body, that model may become even more obscure when the relata are not even of the same kind, where we have neither a double "*mixis*" of solids nor a double "*krasis*" of liquids, but the double trouble of something essentially unextended being coextensive with something essentially extended and of something essentially unthinking thinking with something essentially thinking.

For all that it is a mystery, the Stoic *unio inconfusa* can be used to pinpoint better some queries that arise about Descartes' dualism. One is: how did Descartes understand the substantial union, when conceived apart from the real

[108] Though most of the witnesses to this doctrine (notably Nemesius, Alexander, Tertullian and Plotinus, see *SVF*, II 790–800) are hostile to it, they give a good sense that the Stoics thought it necessary to argue for the bodiliness of the soul.

[109] See also, for instance *Discourse* IV, CSM I p. 127; AT VI pp. 32–3; *Search*, CSM II p. 412; AT X p. 518.

[110] *Meditations* II, CSM II p. 18; AT VII p. 27: "[...] *non sum etiam tenuis aliquis aër istis membris infusus, non ventus, non ignis, non vapor, non halitus*."

[111] Ibid., "*{f}ortassis vero contingit, ut hæc ipsa, quæ suppono nihil esse, quia mihi sunt ignota, tamen in rei veritate non differant ab eo me quem novi? Nescio*."

[112] *Meditations* VI, CSM II p. 54; AT VII p. 78.

distinction? The other is: how does his solution fit with the things that he says about the connection between the mind and the body at the pineal gland?

In response to the first of these questions, we may turn to some further remarks Descartes makes in connection with the dispute with Voetius at Utrecht. In the letter to Regius cited above, Descartes is coaching him in how to defend the Cartesian position. Two of the theses that had come under attack were: (A) the Cartesian denial of substantial forms; and (B) Regius' assertion – in the name of Cartesianism – that a human being is an *ens per accidens*. What I have set out so far is meant to help us to understand how Regius' version of Cartesianism as regards (B) is not Descartes'. That is, if a human being is a union of mind and body as Jesus is of God and man, then a human being is not an *ens per accidens*.[113] But there is a point at which Descartes refuses also (A).

Descartes reponds tartly to Voetius' three reasons for holding that there must be substantial forms (from the need for a principle of unity; from the need for a concept of a thing; and from the need to re-identify things through change)[114:] he says that these arguments would apply as well to a clock, which no-one thinks is a substance.[115] What Descartes is rejecting here is the usual count of substantial forms, which extends the status of substance to all sorts of natural objects. He rejects, that is, the Aristotelian view that it is sufficent for there to be a substance that it have within it its own principle of change.

He proceeds, in response to Voetius' further argumentation, to say that the coming into being of substances would require special divine creation, which not even the supporters of substantial forms say happens.[116] He makes one exception. This is the Soul (with a capital letter). The Soul, he says, is the true substantial form of man, which is believed to be directly created by God precisely because it is a substance.[117] That is, whereas the Aristotelians count a substantial form wherever there is a natural object, but do not see that this would call for an immense amount of divine intervention, Descartes does so only where there is the sort of being that many people are ready to regard as calling for individual creation. Namely, a human being.

In referring the details of the Utrecht dispute to Father Dinet, Descartes takes up the issue of whether, being a composite of two distinct substances,

[113] See *Notes on a Certain Programme*, 2nd obj. ad 2, CSM I p. 299; AT VIIIB p. 351.

[114] Voetius' text is carried at AT III pp. 514–5.

[115] Letter to Regius, January 1642, CSMK p. 208; AT III p. 505: "[*r*]*ationes omnes, ad probandas formas substantiales, applicari possunt formæ horologii, quam tamen nemo dicet substantialem*." Voetius himself denies that a clock has a substantial form all its own in the Fourth Thesis (AT III pp. 515–6).

[116] Letter to Regius, January 1642, CSMK p. 208; AT III p. 505: "[...]*videmus autem quotidie multas ex illis formis, quæ substantiales dicuntur, de novo incipere esse, quamvis a Deo creari non putentur ab iis qui putant ipsas esse substantias*."

[117] Loc. cit.: "[...] *confirmatur exemplo Animæ, quæ est vera forma substantialis hominis; hæc enim non aliam ob causam a Deo immediate creari putatur, quam quia est substantia*."

a human being is an *ens per accidens*.[118] And he attributes to Regius—and by implication to himself[119]—the denial that there are substantial forms of material things, except the rational soul.[120]

This is sure to raise a further query: why categorise the soul as an attribute of the body, rather than as a distinct substance? There are three ways of responding to this query.

One is to recall that this formulation of Descartes' position is called for because he has been spurred to clarify the half of his doctrine on the nature of human beings that most people take for granted: most people take the substantial union for granted, but need the distinctness of substances pointed out to them. That is, given the difficulty of conceiving distinctly and at one go both halves of the substantial union of distinct substances, it may be inevitable that some aspects of the matter be obscured. Moreover, it is a formulation for consumption by the friends of substantial forms: precisely the Aristotelians, for whom soul is an attribute (albeit a very special one) of the body.

Second, saying that the soul stands to the body as an attribute stands to its subject, does not commit Descartes to saying that the soul is not a substance. According to his standard definition of substance, for instance at *Principles* I 51, all that is required is that a substance be what exists in such a way as not to depend for its existence on any other thing (except of course divine concurrence). But this does not imply that a substance could not exist in such a way that it *does* inhere in some other substance.[121] The crucial condition is that the inhering substance should not depend for its existence on the substance in which it inheres. If being a mere attribute means existing only in such a way that it does depend on a substance, then the soul is not a *mere* attribute. But we can think of it as an attribute of the body all the same. Just so long as we remember that it is a substance too, because it can exist without the body.

Third, there is Descartes' analogy, in the letter to Arnauld to which we have already referred[122] and in *Sixth Replies,*[123] between what he understands to be the soul's relation to the body and what he and others have mistakenly thought to be the relation between a body and its weight. In part, Descartes is respond-

[118] Letter to Dinet, edited out of CSM II (cf. p. 393); AT VII p. 587.

[119] V. Chappell is very cautious about the implication here, in "L'Homme Cartésien," p. 414: "[...] *il n'y a pas même l'apparence qu'il le* [sc. Regius' view] *reconnaisse comme son propre avis*." But, in trying to get Dinet to judge in favour of his own Cartesianism, Descartes is trying to present Regius' way of putting things as, at worst, verbally unfortunate.

[120] Loc. cit.: "[*quæstiones*] *quarum præcipua erat* de formis substantialibus rerum materialium, *quas omnes, excepta anima rationali, Medicus negarat.*" Here, I take it that the "except the rational soul" is Descartes' correction to Regius' overhasty exclusion of substantial forms.

[121] For this reminder, see P. Hoffman, "The Unity of Descartes's Man", pp. 339–70.

[122] I.e. letter to Arnauld 29th July 1648, CSMK p. 358; AT V p. 223.

[123] *Sixth Replies*, ad 10, CSM II pp. 297–8; AT VII pp. 441–2. "Also to Elizabeth 21st May 1643, CSMK p. 219; AT III, p. 667".

ing to Arnauld's query about how there can be mind-body interaction,[124] but once we have a picture of how he conceives of the substantial union as a sort of *unio inconfusa*, questions of interaction become much less pressing. Though Descartes denies that the body-weight analogy can really clarify the very certain and evident fact that the mind and the body do interact, the opponents of the sort of dualism that follows from the real distinction will take that fact simply as proof that there are not two distinct substances interacting here.

The analogy with weight depends essentially on the fact that Descartes and others have made a mistake about its nature. As a child, with his conceptions all bound up with physical things, Descartes took it that the weight of a stone was a real quality of it. This is the position also of many who have not freed themselves of the infantile prejudice in favour of what the senses show us.[125] We falsely think that the weight moves the stone: the error is to conceive the weight as if it were a substance.[126] And we falsely think that the weight is spread throughout the extension of the stone in such a way as to penetrate it through and through,[127] because the weight is equally present in all the parts of the stone.[128]

Descartes' point is that, while this is all wrong about the weight of a stone, it is all right about the soul of a body.[129] This is why he says, in a formula that connects directly, or perhaps through Augustine,[130] with the double mixture of Stoics, that he cannot understand the coextension of the mind and the body in any other way than that the whole of the former is in the whole and

[124] See his letter AT V p. 215: "[...] *vix intelligi possit, quomodo res incorporea corpoream possit impellere*."

[125] *Sixth Replies*, CSM II p. 297; AT VII p. 441; cf. *Discourse* II, CSM I p. 117; AT VI p. 13: "[...] *pour ce que nous avons tous été enfants avant que d'être hommes, et qu'il nous a fallu longtemps être gouvernés par nos appétits et nos précepteurs, qui étaient souvent contraires les uns aux autres, et qui, ni les uns ni les autres, ne nous conseillaient peut–être toujours le meilleur, il est presque impossible que nos jugements soient si purs, ni si solides qu'ils auraient été, si nous avions eu l'usage entier de notre raison dès le point de notre naissance;*" also *Principles,* I 1 ("[*q*]*uoniam infantes nati sumus...*" [AT VIII A p. 5]), through I, 47 ("*in prima ætate mens ita corporis fuit immersa*" [AT VIII A p. 22]) and I, 66 ("*nemo nostrum est, qui non ab ineunte ætate judicavit.*", [AT VIII A p. 32]), to I 71 where the theme is recurrent and echoes the "*ineunte ætate*" of the first assertion of *Meditations* I.

[126] Cf. *Sixth Replies*, CSM II p. 297; AT VII p. 442: "[...] *etsi vocarem illam* qualitatem*, quatenus scilicet ad corpora, quibus inerat, ipsam referebam, quia tamen addebam esse* realem*, revera putabam esse substantiam*."

[127] *Sixth Replies*, CSM II p. 298; AT VII p. 443: "[...] *quamvis gravitatem per totum corpus, quod grave est, sparsam esse imaginarer*."

[128] Loc. cit.: "[...] *dum corporis gravi manebat coextensa, totam suam vim in qualibet eius parte exercere posse videbam*."

[129] This is a point that has foxed even the most astute commentators such as John Cottingham, see his *Descartes*, Basil Blackwell, 1986, p. 120; also Strawson, "Descartes and Elisabeth."

[130] *De Trinitate*, VI, 6, 6.

in each part of the latter.[131] In this way, the interaction of mind and body is not an *ad hoc* adjunct to what we think (mistakenly) we understand in other causal interactions, but is the paradigm of it. Indeed, it is the only natural case of it.[132]

To return to the other question that arises out of the thought that the Cartesian human is a double mixture of body and soul, we should consider the relation between this sort of through-and-through ensouledness and the picture that Descartes often presents of the mind as acting on the body only at the pineal gland. Of course, these two elements are sometimes presented together, as in *Passions*, I 30 and following, or at *Principles*, IV 189. But it is the latter of them that has been a popular target for those who deny dualism on the grounds of the impossibility of interaction of such distinct substances as mind and body. And it is made to seem all the easier to hit this target because Descartes introduces animal spirits seemingly as a way of bridging the gap between something essentially unextended and something essentially extended. Appeal to the animal spirits seems to be a shift that doesn't really answer the question of how the interaction takes place, but merely delays it.

Though Descartes took his physiological story seriously, the details need not detain us for present purposes. It does not matter at all *where* the mind acts on and is acted on by the body; it could as well be in the heart or the knees[133] as in the brain. Nor does it matter *how* the interaction takes place; it could as well be directly as by the intermediation of the animal spirits. For, the problem is that we have one model on which the soul is present throughout the body, and another on which it is present only by connection with a small part of the body (perhaps at a point).

John Cottingham reminds us of "Descartes' frequent recognition of the special character of sensation, and its recalcitrance to straightforward classification under the categories of extension and thought".[134] This does not, however, commit Descartes to the existence of a *res sentiens* in addition to the *res cogitans* and the *res extensa*. Since, to some extent, Descartes does allow that non-human animals have sensation and other functions that are not strictly a matter of thought,[135] it seems that sensation can be, to that extent, a feature

[131] *Sixth Replies*, CSM II p. 299; AT VII p. 442: "[*n*]*ec sane iam mentem alia ratione corpori coextensam, totamque in toto, et totam in qualibet eius parte esse intelligo*."

[132] There is also at least one supernatural case that Descartes envisages, namely, the presence of Christ in the Eucharist, which he discusses with Arnauld.

[133] On ancient valuations of the knees as a seat of *psuche*, see R.B. Onians, *The Origins of Modern Thought about the Body, the Mind...*, Cambridge University Press; 1951, pp. 185–6. A theory whose time has not yet come?

[134] J. Cottingham, "Cartesian Trialism," *Mind*, XCIV (1985), pp. 218–30, p. 229.

[135] E.g. in *Discourse* V, Descartes concedes that a parrot or a monkey does have a soul, though wholly different in nature from ours (CSM I p. 140; AT VI p. 58: "*âme* [...] *d'une nature du tout différente de la nôtre*"); see also J. Cottingham, "Descartes' Treatment of Animals" (1978), in J. Cottingham (ed.) *Descartes*, Oxford University Press, 1998, pp. 225–33.

or activity of embodied, extended things.[136] But what is strictly a matter of thought never is. Nevertheless, in humans, sensation (as well as imagination and the like) is a special mode of thought.[137]

The distinction that is in play here may have roots that go back beyond Aristotle's distinction of the vegetative, locomotive and rational souls[138] to Plato's various pictures of the soul as itself composite.[139] But there is a moment in its unfolding that may come as no surprise in the light of the foregoing and which is reported by Sextus Empiricus, who tells us that some Stoics, particularly Zeno, say that soul has two meanings: what sustains the whole compound and the naturally-ruling faculty (*hegemonikon*).[140] The naturally-ruling faculty is repeatedly associated both with reason;[141] and with survival after the death of the body (though the Stoic soul is not absolutely immortal).[142] We are told by Philodemus that the Stoics disagreed about where the naturally-ruling faculty was to be located, some placing it in the head and the majority in the chest or around the heart.[143] Yet any such location must be taking the soul in a different sense from that in which it is like the wine in the sea, as forming a double mixture with the body.

Whether or not all the Stoics would have allowed that there were two senses to the word "soul," it seems that here we have an analogue to our question about Descartes: can the soul be both located in just one part of the body (e.g. at the pineal gland) and yet be present throughout it? To which the answer seems to be that it can, so long as we distinguish those functions of the soul, such as sensation, that have to pervade the body (lest we angelically merely observe bodily damage rather than feel pain), from those that are, in the strict sense, matters of thought.

The sole modes of thought properly so-called, as we are told in *Meditations* IV and at *Principles* I 32, are intellection and willing. These are to be regarded as having their special, localisable, seat in a particular part of the body on the grounds to which Descartes frequently makes appeal and to which we have already made reference, namely that the mind is indivisible, while the body, being extended, is divisible. But the soul in the broader sense, including sensation and the like, is present throughout the body.

[136] Cf. *Principles* I 23, CSM I pp. 200–1; AT VIII p. 13.

[137] See the texts cited by Cottingham, "Cartesian Trialism," pp. 220–1.

[138] E.g. *De Anima*, II iii, 414 a 31–3.

[139] E.g., *Republic* IV (436–40), IX (588), *Phædrus* (248), *Timæus* (69–71).

[140] *Against the Mathematicians*, VII 234, in LS, 53F: [...] also Iamblichus *apud* Stobæus, *Eclogues*, I, 49, 34, *SVF*, I, 143 (b).

[141] E.g. Galen, *On Hippocrates' and Plato's Doctrines*, V, 3, *SVF,* II, 841, and in greater detail on the functions that make up reason *On the Use of the Parts*, VIII 6, *SVF*, II, 860, ll. 13–4 (p. 232).

[142] Cf. the texts collected at *SVF*, II, 809–22.

[143] Philodemus, *On Piety*, *SVF*, III, (Diogenes of Babylonia), 33.

This seems to introduce a fresh set of uncertainties about how the parts of the soul can interact. How, for instance, can the spatially distributed faculty or faculties of sensation causally affect the essentially unextended mind? Or are we to think of the Stoics' sense of the soul as extended as a metaphysical rendering of what Descartes says about animal spirits? Though these uncertainties may seem fresh in the consideration of Descartes, they are not so fresh in the consideration of the soul in general. Those who hold the soul is the actuality of a living body have problems with, or suddenly go vague about,[144] accounting for how a 'common sense' can gather the various inputs of the perceptual apparatus. So the presence of such uncertainties does not count against attributing something like the Stoics' distinction of a located naturally-ruling rational faculty and a pervasive sensitive soul to Descartes.

In one respect, the real distinction between body and mind functioned to put an end to these uncertainties by drawing a picture of the body on which the channelling of the flow of information has a physiological basis in the nervous system, focused on a certain portion of the brain. Yet, in line with the substantial union, the presence of soul throughout the body they remain uncertainties. Granted the difficulty of conceiving distinctly and at one go both positive parts of Descartes' picture of the human being, we can nevertheless see where the problems for each arise. On the version of dualism that is criticised for being unable to account for the interaction of mind and body, the point of alleged interaction is well identified as, for instance, the pineal gland. On the consensual view (*vulgo*), which I have been taking to be Aristotelian in character, there seems to be no obvious place at which there is anything like interaction between the senses, the common sense and the intellect, because there is no effort to provide a physiology to carry the load. Which may be a reason why there was not seen to be any urgency about establishing *how* the common sense and the intellect can communicate with the sensitive faculties. While Aristotle and his successors are clear that the rational part of the soul has very different characteristics from the others and are ready to exalt intellect and reason over sensation, they make almost no significant effort to explain how they mesh into a psychic unity. Simply saying that they do mesh is no better, and no worse, than Descartes' appeal to the certain and evident fact that the mind and the body do interact.

In summary, the emphasis that Descartes generally puts on the real distinction is a result of the difficulty – for human wit – of conceiving distinctly and at one go that a human being is a double mixture of two distinct substances. The notion of double mixture that seems to model the relation in

[144] For instance, in the passage of *De Anima,* III, ii where Aristotle starts introducing the *sensus communis* (428 b 8–21) he does not propose any sensory organ by which, for instance, we can tell the difference between sweet and light. When he comes back to consider the matter at the very end of *On Sense and Sensible Objects* (viii, 449 a 5–20) all he says is that the general faculty of perception (*aisthetikon panton*, 449 a 17) is different in its being from the individual senses.

question is mysterious and generates uncertainties of its own. But these are not obviously greater mysteries or uncertainties than everyone else runs into. This is a rather negative result, but it is one, I contend, that permits us to take a distance from the sort of argument from the difficulty of interaction that has been popularly used as quick way with Descartes' dualism.

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What is (not) Leibniz's ontology? Rethinking the role of hylomorphism in Leibniz's metaphysical development

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Abstract: A central controversy in the reception of Leibniz's philosophy, not only during his lifetime, but also in the immediately posthumous period (1720's) and more recently, concerns the role that substantial forms play in Leibniz's ontology. Interpreters like Garber argue that the Leibnizian defense of the quasi-Scholastic substantial forms in the 1680's-1690's demonstrate an ontology of corporeal substance irreducible to an idealist ontology. On the other hand interpreters like Adams argue that corporeal substances reduce to a fully idealist ontology and that this period in Leibniz's work only demonstrate a modification of idealism. In this paper I argue that without clarifying the ambiguous status of what constitutes "ontology" for Leibniz, the stakes of this longstanding debate are unclear and the anti-idealist position appears to be a self-defeating one. By turning to a thorough reading of Leibniz's transition from the middle to the late years and noting key turns in its historical reception (vis à vis Wolff and others), I argue that the anti-phenomenalist position becomes meaningful in light of an idealist ontology rather than in spite of it. My aim is not to defend either idealism or anti-idealism but rather to reconfigure the nature of the controversy concerning substantial forms by outlining the limits of current debates over Leibniz's ontology.

Keywords: *Substantial forms; phenomenalism; physical realism; prime matter; secondary matter; unity of organism; natural theology.*

I. Introduction

In the last few decades of Leibniz scholarship, an ongoing debate about Leibniz's idealism has provided the stage for re-examining Leibniz's ontology.

[1] The author would like to thank the Groupe de recherche sur Leibniz, J. Colin Mcquillan and the anonymous reviewer for their helpful remarks on an earlier draft of this paper.

This term, "ontology," used by many of the participants of the debate, D. Garber, R. Adams, G. Hartz, M. Fichant, D. Rutherford and others, take the term roughly as an account of the fundamental or, in a manner of speaking, "bottom" layer of reality by virtue of which the other layers of reality (phenomenal, imaginary, etc.) gain their "realness."

From the Aristotelian tradition we inherit at least two major ways to understand the philosophical treatment of problems concerning "*what is.*" A metaphysics or *prima philosophia* (*πρώτη φιλοσοφία*) can be understood in two senses. The first, which we might call a *Theologia*, the Latin rendering of *θεολογία* treats, as Aristotle says in the first book *A* of the *Metaphysics*, "first principles and causes."[2] The second, which we might call "ontology", although not fully spelled out by Aristotle, has as its aim, as Aristotle says in the fourth book, "being as being and the attributes which belong to this in virtue of its own nature."[3] Any overly hasty attempt to separate or unite these two aspects of the *Metaphysics* is subject to error and it is certainly not my aim here to provide a definitive interpretation of this problem that has worried commentators across the centuries. Speaking of Leibniz's metaphysics *generally* allows us to see that both kinds of investigations, that of first causes and principles as well as that of being as such, were present in his writing. By distinguishing metaphysics between a *scientia specialis* and *scientia generalis*, to borrow the scholastic terminology, my aim is to avoid *ad hoc* understandings of an "ontology" implied in interpreting Leibniz's philosophical positions whether this entails a "mapping" of ontic relations or an account of "fundamental" reality.

Within the context of contemporary Leibniz interpretation, this debate about "fundamental" reality is construed as an ontological one insofar it is a dispute over whether there is something like a mind-independent physical reality or a "realism" in Leibniz's metaphysics during his "middle years" (late 1670's to late 1690's): from his immediately post-Paris period (post-1676) to his later explicitly "monadological" period (circa 1700 onward). If we take Leibniz's paradigmatic metaphysics to be characterized by his mature monadological view that "there is nothing in things except simple substances and in them perception and appetite,"[4] it appears that what *is* exists by virtue of monads qua simple substances and physical reality is reduced to mind-dependent perceptions and appetites imbued by God into the monad qua substance in creation. This monadological framework for interpreting substance is what interpreters have called a "strong phenomenalism"[5] where the

[2] Aristotle, *Metaphysics*, 982b 9–10; *The Basic Works of Aristotle*, ed. by Richard McKeon, New York: Random House, 2001, p. 692.

[3] Aristotle, *Metaphysics*, 1003a20–21; *The Basic Works of Aristotle*, p. 731.

[4] Leibniz, Letter to De Volder, 30 June 1704; G II 270; AG 181.

[5] This "strong" phenomenalism is usually attributed to R.M. Adams who argues in his 1994 *Leibniz: Determinist, Theist, Idealist* that Leibniz remained rather consistent throughout his philosophical writing in treating matter and bodies as appearances and hence strictly or

layers of reality, physical and otherwise, ultimately reduce to a realm of well founded phenomena."[6]

Opponents to the phenomenalist interpretation like Garber attempt to counter-pose a "realism" or "physicalism" of Leibniz's middle years against the idea that this phenomenalism was thorough-going in the entire period of Leibniz's mature (post-1676) thinking. However these positions are not necessarily contrary and the reductive or *strong* phenomenalist account is only anti-realist with regard to a *certain* conception of bodies. To assert the irreducibility of bodies to mind does directly imply realism but a realist account of body need not exclude their ultimately immaterial nature. Phenomenalism's strongest advocate, R.M. Adams, used the term "idealism" to describe Leibniz's ontology insofar as he asserted that the "reality" of bodies is to be reduced to the operations of the mind-like monad. Interpreters like Rutherford have argued, in turn, that idealism does not directly imply phenomenalism. In this reading one need not accept a phenomenalist position if we consider the order or structure of monadic coordination, the structure responsible for corporeal reality, to be irreducible to intra-monadic perception. As such, Leibniz's account of physical reality is indeed idealist or non-material but has a realist metaphysical foundation or reality, *independent from* and *irreducible to* phenomenal perception.[7]

With this confusing mix of "-isms," realism, phenomenalism and idealism, we can easily lose sight of the stakes in these conflicting interpretations. Although the use of "idealism" to characterize Leibniz's philosophy by contemporary interpreters is not wrong, we must recognize that this term was anachronistic to Leibniz. Although "materialism" was used to describe certain Ancient Greek and Hellenistic philosophers, and, in turn, philosophers like Hobbes and Spinoza in a derogatory way to mean "atheism," its counterpart "idealism" came into currency through Christian Wolff's *Psychologica Rationalis methodo scientifica pertractata* in 1722, six years after Leibniz's death. Even here it was Berkeley and not Leibniz who represented this idealist position for Wolff. Leibniz would represent a sort of "dualist" in Wolff's classification.[8] With regards to the contours of contemporary Leibniz interpretation, this anachronism can cause confusion. What idealism means in our

strongly reducible to phenomenon. In the terms of Leibniz's mature philosophy, Adams explains that, "since all bodies have substances 'in' them, they can be regarded as appearances *of* substances as well as appearances *to* substances. They can even be treated as aggregates of substances.... Therefore, Leibniz must argue that aggregates of substances are merely appearances." Robert M. Adams, *Leibniz: Determinist, Theist, Idealist*, New York and Oxford: Oxford University Press, 1994, p. 240.

[6] GP VII 344; AG 319.

[7] Donald Rutherford, "Metaphysics: The late period", in Nicholas Jolley (eds.), *The Cambridge Companion to Leibniz*, Cambridge: Cambridge period," in University Press, 1995, p. 147–148.

[8] M. Fichant, "La dernière métaphysique de Leibniz et l'idéalisme," in *Bulletin de la société française de philosophie*, 3, 100 (July–September 2006), pp. 1–37, p. 14. Cf. Christian Wolff,

interpretations of the classical idealists is different and the resulting ontology can also be widely divergent. Sticking too closely to the term "idealism" for interpreting Leibniz's ontology fails to make meaningful distinctions outside of heuristic classification.

The contemporary debate over Leibniz's ontology concerns a specific problem. Opponents of the reductive phenomenalist view argue that in Leibniz's middle years, roughly two decades from the late 1670's to the late 1690's, Leibniz maintained a tendency to treat bodies as real in the sense that they are not merely reducible to phenomena. In this, among other writings at the heart of these middle years, Leibniz engaged in prolonged correspondence with the eminent Cartesian A. Arnauld where we find some of the most compelling evidence of the notion of "corporeal substance" which appear irreducible to phenomena. In this context Leibniz would write, "I think I have shown that every substance is indivisible and that consequently every corporeal substance must have a soul... since otherwise bodies would be no more than phenomena."[9] Though this dense sentence merits more explication, all I can do here is to point out Leibniz's explicit rejection of the reduction of corporeal substance and, hence, bodies to phenomenon. As such, the interpretive question is about whether Leibniz's reduction of bodies to phenomena in the later monadological period can be attributed to the middle years. In turn, with regard to the question of ontology, the further question is whether this irreducibility of bodies to phenomena would suggest an ontological commitment to a world of corporeal substances which are hylomorphic syntheses of a mind-like soul or entelechy and matter.

The aim of this article is not to directly intervene in this debate but rather to cast a different light on these questions in order to critique its apparent importance and to reorient the questions being asked. Here the commentators' use of the term "ontology" provides useful way to enter these questions. The equivocal use of the term by commentators allow us to diagnose why terms like idealism, realism and phenomenalism stand in for positions concerning *specific* aspects of Leibniz's metaphysics distinct from the more *general* theme of ontology. As I will argue in detail below, understanding the corporeal "realism" of Leibniz's middle years through a more careful dissection of what is "ontological" in Leibniz can not only help clarify the importance of his tendency to treat corporeal things as irreducible to phenomenon in his middle years but also to grasp why a monadological view, indeed an idealist one, is indispensable for understanding what "ontology" means for Leibniz.

In what follows I will first lay out the central claims of Garber's "realist" interpretation of Leibniz's ontology in his middle years. The evaluation of this

Psychologica Rationalis methodo scientifica pertractata, 1734; reproduction of the 1751 edition, Hildesheim: Olms publishing, 1994.

[9] GP II 121.

interpretation aims to highlight a crucial aspect of the argument. Garber's realist interpretation can only be successful if the two aspects of the hylomorphic substance that Leibniz develops in his middle years, form and matter, are irreducible one to the other. In looking at the two major kinds of arguments Garber relies on, I point to a crucial problem, also raised by critics of this position, that Leibniz's notion of prime matter and, by implication, body, is something that seems either to be an incomplete account or, worse, actually implies a body reducible to mind-like form. I suggest that the reason why we run into this dilemma is due to our imputation of a full-fledged "ontology" on Leibniz in this period; mistaking the *specialis* for the *generalis* in taking one aspect of Leibniz's metaphysics for a treatment of being qua being. Through an alternative way of understanding Leibniz's middle years suggested by Fichant, I show that Leibniz not only changed his position on a number of important "ontological" questions but also changed his approach to metaphysics. That is, whereas Leibniz saw his metaphysical project as a kind of natural theology, a search for a variety of first causes, he eventually prioritized substance itself and the questions concerning being qua being. The different way in which Leibniz construed the nature of unity provides the contours of this transformation. Finally I argue that Garber's interpretation can help us understand how far Leibniz was from his late idealist ontology not because the latter had a different ontology in the middle years but because he had not yet developed one. This helps us resituate the different aspects of Garber's realist interpretation and allows us to re-frame Leibniz's deep commitments to corporeal substance in the middle years.

II. Against phenomenalism

Bracketing problems of what "ontology" means for Leibniz for the moment, we start out by looking more directly at counter-arguments against the attribution of a strong phenomenalism or idealism of Leibniz's middle years. The burden of the opponents to phenomenalism is to show that Leibniz had an account that does not reduce bodies to intra-monadic phenomenal effects. It is important to highlight two different ways of arguing this. The first way is dogmatic and argues that Leibniz held a position that denies the reduction of bodies to intra-monadic content. Garber is the best representative of what I am calling the dogmatic approach because he directly contests the attribution of idealism to Leibniz's middle years by arguing that Leibniz had another view in mind, that of a hylomorphic corporeal substance in the tradition of Aristotelianism and Scholasticism. This differs from a second approach, which I will call the architectonic reading, where we find a multiplicity of views which fade in and out of priority throughout Leibniz's development. This second approach is less direct in contesting the claims of a phenomenalist interpretation than the former but also stands in opposition to the phenomenalism

insofar as it argues that the organization of reality found in the late monadological view is qualitatively different from that of these middle years under dispute. As such, since Leibniz's phenomenalism is defined through Leibniz's late metaphysics, demonstrating a qualitative difference between this view and the middle period contests whether a reductive phenomenalism was actually the aim of Leibniz's metaphysics in this "middle" period in question.

A major aspect of Garber's contribution to Leibniz interpretation has been his raising of the issue of corporeal substances in Leibniz's middle years. This view was first extensively defended in his 1985 essay, "Leibniz and the Foundations of Physics: the Middle Years"[10] and then in more detail recently in his 2009 book *Leibniz: Body, Substance, Monad*.[11] This is not the place to evaluate the entirety of his argument but only to point to the key points on which this interpretation turns. As we have seen above, given the context of the contemporary debates, it suffices to demonstrate the irreducibility of bodies to perception and appetite in order to argue against a reductive phenomenalism in Leibniz's middle years. Garber's argument is roughly based on showing this irreducibility through two lenses. The first is the problem of aggregation. The second is the problem of force.

The core of Garber's developmental interpretation of Leibniz is that the latter's struggle to re-vitalize substantial forms in his immediately post-Paris period (post-1676) led to a prolonged engagement with a notion of corporeal substance of Aristotelian and Scholastic inspiration understood as mind-body hylomorphic substances. This view qualifies as non-idealist or non-reductively phenomenalist insofar as either of the two counter-parts of this hylomorphism should be irreducible to the other. As such, the first problem, that of unity and aggregation, provide the lens to understand this qualitative distinction between minds or forms and body or matter. Garber assigns the rough starting date of Leibniz's middle years to the 1678 "*Conspectus Libelli,*" an outline for a book that was never written. Here, Leibniz sets himself up with the task of accounting for the two principles of substance that will rehabilitate substantial forms in modern philosophy. In this context, form is understood as a "principle of unity and duration" and matter, on the other hand, is "that of multiplicity and change."[12]

The problem of the relation of the one and the many or unity and multiplicity was not only a principal philosophical inheritance that runs through Ancient Greek thought to the late Scholastics but also a crucial locus of dispute during Leibniz's time. We see different ways of treating this question in

[10] Daniel Garber, "Leibniz and the Foundations of Physics: The Middle Years," in K. Okruhlik and J. R. Brown (eds.), *The Natural Philosophy of Leibniz*, Dordrecht: D. Reidel Publishing Company, 1985, pp. 27–130.

[11] Daniel Garber, *Leibniz: Body, Substance, Monad*, Oxford and New York: Oxford University Press, 2009.

[12] Garber, *Leibniz: Body, Substance, Monad*, p. 55; A VI, 4, N. 1988.

Gassendi, Descartes, Spinoza and others. Yet insofar as Leibniz was concerned with substantial forms in the writing of this middle period, this problem of unity and multiplicity was construed as the problem of the reality of aggregates. Now, an animate body can be understood through the union of a soul or mind with matter or body and the former imparts the latter an organization, principle of action and an underlying identity through change. This soul or mind is, in short, the unity of a living thing (or organism). In more Aristotelian language, we might say that this unity which organizes its multiple parts is the formal cause of the thing. Yet, what happens when an animate being dies? Like a cadaver, a block of cheese or a rock, there is some unity that cannot immediately be accounted for by a formal aspect understood through mind or soul. How does an inanimate body like a diamond then cohere? What could be responsible for its unity? Leibniz's response to this question, one that distinguishes him from Descartes and other contemporaneous thinkers, is that he takes these dead or inanimate bodies to have a degree of reality that is owed to its composition from an aggregate of smaller mind-body hylomorphic substances. This can be understood variously as the organs which compose a dead body or microscopic animals that can be found in every smaller part of reality that we might wish to divide a body. As such, Garber quotes Leibniz's remark that, "man... is an entity endowed with a genuine unity conferred on him by his soul, notwithstanding the fact that the mass of his body is divided into organs, vessels, humors, spirits, and that the parts are undoubtedly full of an infinite number of other corporeal substances endowed with their own entelechies."[13] This "bugs in bugs" theory,[14] as Garber puts it, is indeed one of the very stakes of his consideration of substantial forms. What results in Leibniz's thinking of these middle years is a series of heavy reflections on "secondary matter". An aggregate mass without a top-down unifying form qua mind is real insofar as it is composed of smaller substances which are the very sub-unities that provide the principle of unity at each sub-region of activity and cohesion. This infinitary division into sub-regions is understood at each level as a "form" and its associated secondary matter. Insofar as we never get to the "bottom" of it we would never find a layer of what might be "primary" or "prime" matter. We will take a closer look at this problem later but we should first point to the fact that Aristotle provides a similar schema of "getting down" to matter through division and abstraction in *Metaphysics* Z.3, where when "all else is stripped off evidently nothing but matter remains."[15] But in this context Aristotle argues this point in order to assert that this matter cannot be a separate thing apart from form and thus cannot be a substance.[16] As such, matter is always relative to form. In the *Physics*, Aristotle could not be

[13] Leibniz, Letter to Arnauld, 10 September 1687; GP II 120; Cf. Garber, 2009, p. 83.
[14] Garber, *Leibniz: Body, Substance, Monad*, p. 83.
[15] Aristotle, 1029a11; *The Basic Works of Aristotle*, p. 785.
[16] Aristotle,1029a31–33; *The Basic Works of Aristotle*, p. 785.

any clearer in saying, "Again, matter is a relative term: to each form there corresponds a special matter."[17] These notions of matter resonate with Leibniz's view here. At every level of reality there is a mind-like soul, a form, that organizes its "body" which is in turn a secondary matter that can be understood apart from its form-giving soul as an aggregate of many smaller form-matter substances that make it up. As such, seen through the lens of the unity and aggregation, Leibniz's view is that although secondary matter is relative to its layer of formal unity, matter is qualitatively different from the form that unites it and plays a key counter-part to this whole that cannot be without it. What this implies is that reality has an irreducible corporeal aspect which cannot be reduced to form, that is, mind or soul. Indeed, when considering substantial forms, we see that unanimated things like rocks, cheese and diamonds serve as crucial examples. Leibniz's attempt to give an account of the reality of these things demonstrate that it was for the independent (or substantial) reality of these intermediate layers of secondary matter that the substantial form thesis was invoked in the first place. In other words, we might say that substantial form was invoked for the sake of matter and both sides of this hylomorphic conception were crucial. We would thus have good reason for not reducing physical or corporeal reality to form.

This consideration of the problem of unity and aggregation leads us to a second problem, another lens with which to see the irreducibility of bodies to phenomenon. This is the problem of the force of bodies. Although we can discuss the two aspects that Garber investigates separately, this problem of force is really part and parcel of the motivation for rehabilitating substantial form and the resulting problem of aggregation. We know that Leibniz sought to "reform mechanics" in his late Paris period and took great pains to organize these reflections into a series of treatises from 1678 onward.[18] His principle target was Descartes but he also understood that his own earlier Hobbesian phoronomy suffers from the same critiques he was developing.[19] In brief, Leibniz saw that the conception of bodies, *pace* the notion of *res extensa*, cannot be adequately understood as mere extension, that is, through the geometrical qualities of size, shape and motion. This view matured into a physical project that he would eventually name the "dynamics" which he understood as a "new science" based on force.[20] His later developed view in the 1698 *De Ipsa Natura* demonstrates the link between this science of force to his notion of substance by pointing to two key notions of force. Here Leibniz asserts that, "Indeed,

[17] Aristotle, 194b8; *The Basic Works of Aristotle*, p. 240.

[18] A good example of a comprehensive and synthetic treatise is the 1678 *De Corporum Concursu*. Cf. G.W. Leibniz, *La réforme de la dynamique*, éd. Michel Fichant, Paris: Vrin, 1994, pp. 71–171.

[19] A good example of this self–critique can be found in the 1691 "Preliminary Specimen: On the Law of Nature Related to the Power of Bodies," GM VI, 287–292; AG 108.

[20] GM IV 234–253.

we must admit... that matter resists being moved through a certain natural inertia.... Hence it is in this very passive force of resisting (which includes impenetrability and something more) that I locate the notion of primary matter and bulk."[21] To this notion of passive force, correlated with matter, Leibniz adds a second force. He writes, "a first entelechy must be found in corporeal substance, a first subject of activity, namely a primitive motive force which, added over and above extension... and over and above bulk... always acts but yet is modified in various ways in the collision of bodies through conatus and impetus."[22] The two forces constitute the two sides of substance, matter and form, a notion that that Leibniz had already begun calling "monad" in 1698 but still understood as something "constituted" from form and matter.[23] From a rejection his mechanistic forebears Leibniz develops a view of bodies in nature imbued with a primitive passive force of resistance which qualitatively distinguishes them from the abstract body qua *res extensa* considered geometrically or phenomenally. To this passive force, Leibniz adds an active force that stands in for the positive activity or entelechy of a corporeal substance. As such what is fundamental to his dynamics is the consideration of *forces*, a reality inherent in bodies which holds us back from any simple reduction of the physical world to the phenomenal reality generated by perception.

Garber's arguments against a reduction of physical reality to phenomenon include a number of different issues but the two fundamental bases of his interpretation have been summarized above. Indeed, Garber does think of both of these aspects were motivated greatly by the reform of mechanics. Although Garber does not reiterate his "insistence" in his more recent work that Leibniz's science "loses its grip on reality"[24] when he stops serious work on the dynamics, his recent interpretation of Leibniz continues to puts much weight on Leibniz's reform of mechanics and draws from it the *sine qua non* of the latter's middle years.

Since the turn to dynamics is so central here we should ask then whether these two key aspects of Garber's interpretation, that of aggregation and that of force, in Leibniz's middle years are really compatible. There is no clear reason why substantial forms directly imply the inherent force in bodies and vice versa but on the whole these notions are not contrary either. There is however a problem in Leibniz's means to synthesize these two aspects. Leibniz's treatment of the problem of aggregation through substantial form takes each layer of reality as being composed of form and secondary matter. Each layer of secondary matter can be further understood as composed of form and its respective secondary matter. Since we never get to the "bottom" layer of division through form and matter, we never get to the nature of matter itself.

[21] AG 161.
[22] AG 162.
[23] AG 162.
[24] Garber, "Leibniz and the Foundations of Physics: The Middle Years," p. 99.

As such, to what can we attribute this material and passive force in bodies so boldly asserted in "*De Ipsa Natura*"? It appears that any corporeal thing is made up of a formal dimension expressed as active force and a material dimension expressed as passive force. These are the two sides that make up a corporeal substance. Yet, from the perspective of aggregation, it seems that the process of infinitary division would suggest that we can never arrive at matter insofar as every sub-layer of reality is always already a composite of form and secondary matter. This implies that we can never arrive at primitive passive force since secondary matter is already a form and matter composite.

This problem of where to locate the force of bodies seems to have deeply troubled Leibniz himself. A decade before "*De Ipsa Natura,*" in his 10 September 1687 letter to Arnauld, the heart of the middle years, Leibniz associates the primitive passive force of resistance to primary matter.[25] Although primitive passive force could be attributed to a body, Leibniz remains ambiguous if this is to be attributed to the status of a body understood as relative to its immediately superior form or whether there is some ultimately basic matter, a primary matter, through which passive force or resistance arises bottom-up from these successive layers of form-matter compositions.

This problem flows directly out of the interpretive schema laid out by Garber. Although Garber provides a convincing argument concerning the irreducibility of bodies to mind-like forms in Leibniz's middle years, it is not clear that the positive rendering of the inherent reality of bodies can be explained through this hierarchy made up of this series of hylomorphic counter-parts. The dangerous counter-argument against Garber's interpretation is finally that even though Leibniz might have been committed to hylomorphic substance in his hierarchy of microscopic to macroscopic substances ("bugs in bugs"), the principle of reality remains that of form. As such, insofar as form is understood in Leibniz as soul or mind, body, whether understood as secondary matter or phenomenon, remains inextricably dependent on form as the principle of reality and thus its principle of unity. This problem echoes Aristotle's assertion of the dependence of matter on form in the *Physics* noted above. The problem lies with the fact that although form, entelechy or soul could be understood as active force, its counter-part, passive force or resistance lacks a precise locus in this hierarchy.

In examining Garber's argument we have considered how Leibniz's treatment of substantial forms led to a serious engagement with secondary matter. As such, we have seen how a conception of hylomorphism was at work in Leibniz's middle years. Garber's argument does provide compelling reasons for understanding a corporeal part of the soul-body substance as qualitatively different from the reductive phenomenalism that we might then exclusively attribute to the later monadological view. However we are still unable to place

[25] GP II 120.

a crucial positive dimension of these bodies, passive force, in matter itself. It thus appears as though force, the attribute that replaces Cartesian *res extensa* in bodies, floats ambiguously between form and secondary matter. In other words, since passive force does not find a home in primary matter, it must be a correlate of form. This implies that since form is understood as mind-like, the inherent reality of bodies, force, must in turn be understood as itself mind-like. It might seem then that this search for an inherent reality of matter, irreducible to mind, turns out to be a fool's errand. In the reduction of the reality of bodies to their form, they thus ultimately reduce to mind.

III. What's the matter with matter?

Does an ontological commitment to bodies result from Leibniz's reckoning with substantial forms? From our evaluation above, it seems that Garber's interpretation of this engagement with substantial forms, rather than justifying a real commitment to bodies, only serves to nuance and provide a layer of complexity to an ontology that remains ultimately idealist. Posed as an "ontological" problem, we ask whether this turn toward matter and bodies through the means of substantial forms really comes close to plumbing the depths of a foundational account of substance. On this point Adams argues quite convincingly against Garber's use of Leibniz's turn to substantial forms as a demonstration of his commitment to the irreducible reality of bodies,

> I think Leibniz would have been surprised at the idea that the concept of primary matter would be key to the realism of his physics. If there was any context in which he saw himself as a champion of realism in physics, it was in his critique of occasionalism. In that context, what he regarded as essential to realism about bodies is belief in the reality of forces, especially of the active forces that he identified with substantial forms. For Leibniz it is on the concept of form, not of matter, that realism in physics principally depends.[26]

Adams is here responding to Garber's 1985 article, but the challenge still holds for his more recent book-length treatment. Leibniz's alleged commitment to realism about bodies can only be demonstrated through a perspective that places the project of rehabilitating substantial forms as the primary motivation of Leibniz's middle years. If this is so then the entire question of the ontology of bodies, treated through a hylomorphic distinction of form and matter, can only be made actual through form and not through matter. The ontological hierarchy implicit in hylomorphism does not allow us to resist the reduction of bodies to the actualizing role played by form (as we saw in Aris-

[26] Adams, *Leibniz: Determinist, Theist, Idealist* , p. 339.

totle) and thus brings us back to an idealism in Leibniz for which, with respect to ontology, phenomenalism cannot but appear to be the best explanation.

Fifteen years after Adam's original critique, in a recent review of Garber's 2009 defense of the same thesis, we find similar remarks in a review of *Leibniz: Body, Substance, Monads*. In a sympathetic review of this book by S. Puryear, he points to the same essential problem raised by Adams. Puryear notes,

> What seems doubtful is the suggestion that this story implies that corporeal substances are fundamental to Leibniz's ontology. It is quite true that during the middle years Leibniz thinks he can account for unity and activity in the world by introducing substantial forms which join with bodies to make corporeal substances. But there is nothing in this story which implies that Leibniz considers these corporeal substances to be ontologically fundamental […] Judging by what Leibniz does say during the middle years, it would appear that the substantial form is a much better candidate than the corporeal substances for the role of fundamental entity. For one thing, Leibniz maintains that every corporeal substance is composed of a substantial form and a body. This fact alone would seem to suggest that forms, which he sometimes recognizes as a kind of substance, are more basic or fundamental than corporeal substances.[27]

In our brief discussion of Leibniz's motivation for rehabilitating substantial forms above, we saw the centrality of the problem of matter and in particular secondary matter. Yet as Adams and Puryear both suggest, without further commitment to primary matter, the original commitment to corporeal substances turn out only to privilege the formal aspect to that of matter even within a context where Leibniz was strongly considering a hylomorphic conception of substance. We have examined how from the heart of Leibniz's middle years, in his correspondences with Arnauld, into his late years primitive force was associated with primary matter. In looking at this, we have pointed out how this association is ambiguous at best and commentators have been quick to resist Garber's interpretation on account of this incomplete treatment of matter by noting the relative priority given to form.

Given this discussion, we should be careful to emphasize how the issue of primary matter arises once again in Leibniz's entry into his late monadological phase. Expounding his monadological vision in his 1703 letter to De Volder, Leibniz describes the monad as "completed" with the coming together of an active principle of "primitive entelechy or soul" and a passive principle of "matter" or "primitive passive power."[28] The role of secondary matter here is

[27] Stephen Puryear, "Review of *Leibniz: Body, Substance, Monad*", in *Notre Dame Philosophical Reviews*, accessed 28 September 2012, <http://ndpr.nd.edu/news/24438–leibniz–body–substance–monad/>.

[28] Leibniz, Letter to De Volder, 20 June 1703; AG 177.

played by the subordinated aggregates of monads, the body, considered relative to a dominate monad. With respect to the problem of primary matter, Leibniz reiterates what he had earlier related to Arnauld. Within this later monadological framework, the result of a period of maturation in Leibniz's engagement with substantial form, it appears that both the problem of aggregation and that of force continued to be the primary way in which he gives an account of substance.

Of course we should be careful not to read the maturation of a problem in Leibniz's thought back into a context when no resolution was yet achieved. Although matter is a crucial counter-part of an account of hylomorphic corporeal substance, it was not until the later monadological thesis that it would find a "place" within Leibniz's map of reality. It appears then that, in Garber's reading, primary matter in Leibniz's middle years is something like a "horizon" that continually defers its reality to its participation in sub-layers of corporeal substances. Garber himself argues that,

> With the new monadology comes a new sub-basement in his ontology, a genuine foundation. Leibniz can now say that there is a sense in which there is a foundation to everything, simple substances without parts, something below which one cannot go further, the level of the monads. And with that he finally has a place to put primary matter, primitive passive force, the other notion of matter that he had originally posited in the revolution of the late 1670s. The primary matter, united with the entelechy, now constitutes the non-extended metaphysical atom that Leibniz wants to call a monad. In this way the duality of the notion of matter has been resolved, and the two different notions of matter now find their different places in Leibniz's metaphysics.[29]

In view of the criticisms leveled against him, it seems that Garber's account is in danger of being swallowed by this downward spiral into primary matter. That is, the ontological baseline for corporeal substance for which nothing but primary matter can be adequate turns out to be only answered by the introduction of a non-extended metaphysical "atom", the monad qua simple substance that becomes the very hallmark of the late "idealist" Leibniz.

The fact that contemporary interpreters find it hard to accept Garber's interpretation is thus easy to understand. Garber himself acknowledges that, in hindsight, Leibniz qualified his long path to the monadological thesis "after many corrections and forward steps in my thinking"[30] Seen from the perspective of a conceptual development, we could easily grasp how Leibniz's rehabilitation of substantial forms through a concern for the problem of unity could ultimately, although perhaps ironically, lead to the establishment of a notion of substance understood as monad: simple unity.

[29] Garber, *Leibniz: Body, Substance, Monad*, p. 347–348.

[30] Leibniz, Letter to Remond, 10 January 1714; GP III 606. Cf. Garber, 2009, p. 347.

IV. Reality, substance, unity

What is problematic in Garber's interpretations about Leibniz's middle years is that even if Leibniz started on a project to bring Aristotelian-Scholastic substantial forms into his metaphysics, all of these attempts still relied on forms. The ultimate reason behind this is due to the relative indefiniteness of matter. The aspect of corporeal substances that would resist its reduction to minds appears, as it were, *insubstantial*. As we saw, Leibniz's attempt to reform mechanics sought to do away with the inert and passive matter: the *res extensa* of Descartes. In turn, Leibniz wanted to foreground notions of secondary matter that would imbue bodies with immanent propensities to act and resist. Hence in order to do away with conceptions of inert matter, the price to pay was that the internal structure of corporeal substances could not provide any haven for prime matter, that is, matter itself. As such, although a position based on corporeal substances seems to require the irreducibility of either side of the hylomorphic distinction to the other, the fact that Leibniz could not find any anchor for the "material" side of substance other than through form led directly to the collapse of the articulation of corporeal substances to that of substantial *form*.

Given the qualifications of Garber's interpretation above, I think we can argue from a different perspective in order to 'save" not only this thesis about the qualitative difference between the middle and late years but also the irreducibility of corporeal substances to monads. In treating the problem of matter in substance, we are often misled to think that getting to the "ontological" root of the problem is to get to the "bottom" of reality. With the image of form and secondary matter as a macroscopic body divided into organs and then further into cells and so forth, the "bugs in bugs" image that Garber invokes, questions of fundamental ontology is thought of as a search for the small and elemental. However, the search for unity qua entity or reality does not, in itself, recommend merely one way to arrive at ontological principles. The very large (a whole or totality) or very small (atom or element) are only two among a variety of means to treat ontology through the classical problem of the one and the multiple.

Leibniz's close association of unity with reality or being is peculiar neither to his philosophical inheritance (Plato, Aristotle, the Scholastics) nor with regard to his immediate contemporaries (Descartes, Spinoza). It is crucial to note however that Leibniz had two very different ways to bring themes of unity to reality. In our discussion of corporeal substance above we have considered a notion of unity that plays a "unifying" or synthetic role. This is particularly important to Leibniz's middle years. We saw that the aggregation problem relies on form to hierarchically unify matter at its various levels which is, considered by itself, a principle of multiplicity. We saw that the force problem relies on active and passive forces to come together in order to make a

corporeal substance: *actiones sunt suppositorum*. Here unity is expressed either as the formal organization of a multiplicity, an aggregate, or a substrate that endures a multiplicity of actions and changes. In this same middle period, we also find yet another synthetic notion, one that has not been mentioned until now, that of a unifying or synthetic role played by substance. This is perhaps Leibniz's most famous doctrine, *praedicatum inest subjecto*. Here substance, individual substance, is understood logically as the grammatical subject to which a multiplicity of events and attributes, taken as predicates, is attributed. An individual substance is then determined by its complete individual concept or notion: the complete list of predicates built into a subject by God.[31] In this sense, an infinite number of predicates (events and attributes) individuate the substance known as Julius Caesar or G.W. Leibniz. Unity is expressed in these three notions of substance precisely insofar as they are synthetic and unifying: they unify a multiplicity.

The monadological view emphasizes a qualitatively different notion of unity. We must emphasize that Leibniz never rejects any of the three former aspects of substance but the fundamental account of substance shifts as he moves towards his late period. Something different is foregrounded as *fundamental* to Leibniz's thinking about substance. The monadological view is elemental and the account in the *Monadology* presents, in the first few lines, an argument that aggregates are real because of its ultimate atomic and elemental constituents.[32] These monads provide a metaphysical picture of reality *through* fundamental elements, "the true atoms of nature" and "the elements of things," as Leibniz was apt to describe them.[33] This is also, not surprisingly, why the search for primary matter that we examined above can be understood as fruitful to the later monadological vision. The search for primary matter is a search for a "bottom level" that builds up more complex forms of bodies through organic machines to macroscopic animate beings like sheep and human beings.

The difference between the first synthetic notion of unity and the second elemental notion of unity cannot be immediately seen as identical. Leibniz, having spent years tracing his thread through the labyrinth of the continuum, knows that one could never reach the end of mathematical analysis by dividing extension into smaller and smaller parts. As such, a Gordian knot was indeed cut in asserting the elemental unit of the monad. This qualitative distinction between Leibniz's different ways of thinking about the unity of substance provides a good reason not to read his monadological vision into his middle years. Again, it is important to emphasize that Leibniz never rejects these earlier notions of predicate-containment or the essential link between force

[31] Cf. Leibniz, "*Discourse on Metaphysics,*" AG 41.
[32] AG 213.
[33] AG 213.

and substance. Leibniz's irenical philosophical style has been noted by many scholars[34] and it appears that Leibniz now takes this same attitude to incorporate his own earlier views into his late ones. Nonetheless, the way Leibniz foregrounds the simple and elemental nature of monads qua substances is in stark relief to the notion of unity that he brought to his earlier views.

Pointing to the qualitative differences between the later monadological vision and the corporeal or individual substance of his middle years is sufficient to give us reason to doubt how thoroughly the later monadological or simple notion of substance could be compatible to the views of the middle years. However, the lack of a clear determination of primary matter (or prime matter) remains an obstacle for deciding between the alleged realism and idealism of Leibniz's middle years. The availability of these different models for understanding substance however does provide us with a new perspective on Leibniz's ontology.

V. From metaphysics to ontology

In following the debate about Leibniz's realism concerning bodies, we find that the search for the "really real" stops short of understanding whether Leibniz could give an account of corporeal substances that does not reduce to form, and this, in some ultimate way, to mind. Seen from the perspective of the differing notions of unity, we are in a position to treat these different accounts of substance found in Leibniz's philosophy as different models in which unity can be expressed. Here we find a mereological model based on unity and aggregation, a physical-dynamical model based on force and bodies, a logical model based on subject and predicates, and also a phenomenalistic model based on perceptions and appetites. When we speak of the maturation of Leibniz's *ontology*, it is more meaningful and perhaps closer to Leibniz's own thinking to question how unity is expressed, through what model or complex of models, rather than by privileging a particular position as somehow fundamental.

The alternative view I suggest, an architectonic one, has been promoted by M. Fichant in a number of different works.[35] Starting with the notion that paying attention to the differences in the notion of unity from Leibniz's middle years to his late, Fichant argues that there is no "ontology" properly

[34] Cf. Christia Mercer, *Leibniz's Metaphysics: its Origins and Development*, Cambridge: Cambridge University Press, 2002.

[35] Fichant has never published a book length treatment of his reading but I take his 2004 lengthy introduction of his edition of the *Discourse on Metaphysics* and the *Monadology* as representative. Michel Fichant, "L'invention métaphysique," in *Discours de Metaphysique et Monadologie* by G.W. Leibniz, ed. with introduction by Michel Fichant, Paris: Editions Gallimard, 2004, pp. 7–140.

speaking in Leibniz's middle years and it is only with the rise of simple substance or monads, that we can begin to approach questions about the *nature* of being qua being in Leibniz.

Equipped with the distinction of the differing notions of unity in Leibniz's metaphysics, Fichant shows that what is at stake in the middle years is different from those of the late years. He argues,

> The Monad cannot then be employed except in an anonymous way […] and nowhere will Leibniz write something like "individual monad", not only because the expression would be pleonastic, but rather because the monadic conception of reality dissolves the problem of individuation. The Monad can no longer be exhibited as the referent to a proper name, and this is then why the "monad of Caesar" is a poorly formed expression, which the metaphysical language of Leibniz does not permit us to give any meaning.[36]

From this rich passage, there are three points to be unpacked. First, the individual substance is qualitatively different from the simple substance qua monad on account of the monad's "anonymity". Second, an "individual monad" is pleonastic because monad is by definition radically simple and compositions are real only with respect to this elemental layer. Third, our difficulty in understanding the monad of "Julius Caesar" shows that Leibniz entertains a number of different models for substance and thus the qualitative differences between the individual substance of his middle years and the monad of his later years shows that Leibniz makes a considerable shift in how he understands unity.

First, in Fichant's reading, the individual substance "Julius Caesar" is named by virtue of the subject that unifies its predicates. In the later monadological conception however, there is a "Julius Caesar" monad only in the sense that there is a dominant monad that governs the aggregate of monads that temporarily came together to form such an organic being; a unity that lasts from the birth to the death of such a being. In this case, none of the monads including the dominant monad can be individuated as "Julius Caesar" except temporarily and with respect to this composite organism. The stakes concerned in Leibniz's individual substance in his middle period was that of individuation and hence a substance must be determined by a *complete* concept: the difference of one predicate makes this individual thing something different altogether. The stakes of the monadic account of substance privileges elements and their composition or constitution. Hence the dominant monad of "Julius Caesar" is not *really* Julius Caesar but only the dominant monad qua soul that is sovereign over the body of the aggregate "Julius Caesar." In turn, this body is a composition of monads, each one of them a soul, brought together for the duration of the lifetime of this living being.

[36] [Author's translation] Fichant, "L'invention métaphysique," p. 136.

Second, how is the notion of unity expressed by the simple substance or monad different from that of the individual substance? As Fichant points out, the confusion over the simplicity, singularity and the individual of the monad is not only a contemporary one but rooted in Leibniz's immediate reception. For the late Leibniz, an "individual monad" is pleonastic just as a "composite substance" is contradictory. Here, Fichant points to Wolff's 1721 mistranslation of the *Monadology* from French to Latin of "*les composés*" by "s*ubstantiae compositae*" rather than "*composita.*"[37] Even though there are discussions of substance as either simple or composite in *Principles of Nature and Grace*,[38] Leibniz's mature definition of substances is founded on a notion of unity as radically simple. As such, any composite or aggregate is strictly derived from a first layer of simple elemental unities. In this reading, the monadological position cannot admit anything like a composite substance.

Third, Fichant accounts for the transformation of Leibniz not as a function of the latter's commitment to *corporeal* or *logical* substance but through how different models of substance articulate the competing notions of unity in Leibniz's thought. The architectonic nature of Fichant's interpretation is evident here. Fichant argues that we should view competing models and their resulting tensions in Leibniz's metaphysics in the middle period not as a difficulty in sorting out what "position" Leibniz actually held in that period but rather as a sign that the latter was in the process of actively promoting these different models together. Citing Catherine Wilson's 1989 *Leibniz's Metaphysics: A Historical and Comparative Study* Fichant argues that at least three metaphysical "systems" can be found in his middle years. Taking the *Discourse* as representative of the middle period Fichant, following Wilson, points to three different "metaphysics" within the *Discourse* itself: a logicist metaphysics based on the subject-predicate relation, an Aristotelian-Scholastic metaphysics based on substantial forms including questions of body and force, and a phenomenalistic metaphysics based on the harmony of perceptions.[39] Here Fichant points out that the first two metaphysical views are compatible while the latter two are not. In pointing to this conflict within the *Discourse* itself, Fichant notes that what is often ignored in interpretations of this text is that it was not something meant for public exposition and its immediate audience was only limited to Arnauld and their intermediary Landgrave Ernst von Hesse-Rheinfels. Indeed, only a summary of the 37 section-headings was ever sent to Arnauld. It was only in 1846, in the edition of Grotefend, that

[37] Fichant, "La dernière métaphysique de Leibniz et l'idéalisme," p. 21.

[38] Leibniz writes in *Principles of Nature and Grace* that, "A composite substance is a collection of simple substances or monads.... Composites or bodies are multitudes; and simple substances—lives, souls, and minds—are unities." AG 207.

[39] Fichant, "L'invention métaphysique," p. 74. Cf. Catherine Wilson, *Leibniz's Metaphysics: A Historical and Comparative Study*, Manchester: Manchester University Press, 1989.

anything like a "*Discourse on Metaphysics*" ever became public, an appendix to an edition of Leibniz's correspondence with Arnauld.[40]

The three points made above contribute to our discussion about Leibniz's ontology in that it allows us to recognize a qualitative difference between the middle and later metaphysics by seeing how two different conceptions of unity, synthetic and elemental, make for deep consequences in the very conception of substance. Of course, we have not resolved whether Leibniz was really "realist" or "idealist" in his middle years. Given these considerations however, we have reason to think that models of unity take precedence over questions of realism or idealism in Leibniz's thinking. Here we see that Leibniz considered a number of different models for expressing unity in substance during the same period. This suggests that problems of the reducibility of bodies to minds or minds and bodies to hylomorphic substances should be secondary to how all of these aspects should be read through the transformation of Leibniz's notion of unity. This changes our ontological focus from questions of "reality" to those of "unity."

The ultimate contribution of Fichant to this debate over Leibniz's ontology is his claim that we cannot attribute to Leibniz an "ontology" before his final monadological vision. I do not think that this can be fully defended here but it does provide good reason to rethink the framework of current debates. Following the interpretation of Leibniz's metaphysics in his middle years as a number of qualitatively distinct models for understanding the unity of substance, Fichant adds that it would be hard to characterize Leibniz's metaphysical project in his middle years as ontological. He suggests we understand it rather as a natural or rational theology. We know that it was this sort of characterization of his own project that underlies his efforts in the *Theodicy* as well as how he sees his work as continuous with Plato and Aristotle.[41] This also echoes the sort of philosophical activity that Leibniz attributed to the Chinese, which he found praise-worthy and superior to the "moderns," in *Discourse on the Natural Theology of the Chinese*.[42]

In Fichant's interpretation, there are at least three sites of metaphysical inquiry from which Leibniz's metaphysics of the middle years arose. The first is the theological project that feeds into his theory of substance through the problem of substantial forms: whether the Eucharistic miracle implies that there is something in the bread and wine of communion more than its extended nature and perceptible qualities.[43] The second is the dynamical project

[40] Fichant, "L'invention métaphysique," p. 9.

[41] Cf. Patrick Riley, "An unpublished lecture by Leibniz on the Greeks as founders of rational theology: its relation to his 'Universal Jurisprudence'," *Journal for the History of Philosophy*, 14, 2 (1976): pp. 205–216.

[42] Cf. G.W. Leibniz, *Discours sur la théologie naturelle des Chinois, plus quelques écrits sur la question religieuse de la Chine*, ed. by Christiane Frémont, Paris: L'Herne, 1987.

[43] Fichant, 2004, p. 33. Cf. Leibniz, "Catholic Demonstrations," A II, 1, N. 488–490.

for understanding force as that which explains the *causes* of the geometrical or phenomenal aspects of corporeal motion. The third is the logical project that attempted to make a bridge between truth, understood logically as the containment of a predicate in a subject, and substance.

All three aspects are metaphysical in a direct and obvious way. But as Fichant points out these metaphysical questions were related in Leibniz's understanding of metaphysics as "natural theology." Leibniz relates this very characterization of his own project to Princess Palatine Elizabeth in 1678, "For indeed metaphysics is natural theology and the same God that is the source of all good is also the principle of all knowledge. This is because the idea of God includes in it the absolute being, that is to say that there is something simple in our thoughts from which all of our thoughts has its origin."[44] This view holds that the object of metaphysics is God, the source of Good and the principle of knowledge: the origin of all our thoughts. Echoing aspects of the Aristotelian tradition, metaphysics here is construed as a "first philosophy" of causes and origins. This search for causes ultimately takes God as the proper object of metaphysical inquiry. This self-understanding of the nature of Leibniz's metaphysical project as natural theology continued to resonate a decade later in his correspondences with Arnauld and he explicitly reiterates this in his 28 November/8 December 1686 letter to the Landgrave Hesse-Rheninfels, "We must admit that metaphysics or natural theology which treats immaterial substances and particularly God and the soul is the most important of all. And we cannot make much advancement if we do not have the true notion of substance...."[45] Indeed, this conception of metaphysics as natural theology is the framework through which he wished to address the Landgrave and, in turn, Arnauld through the *Discourse*.

Having pointed to this characterization of Leibniz's metaphysics of his middle years, one wonders when or whether Leibniz ever turned away from the identification of natural theology as metaphysics. Leibniz of course never stopped seeing God as the source of Good, the origin of being and the principle of knowledge.[46] Indeed, a natural theological project continued to be central to Leibniz's work until the writings before his death like the *Theodicy*. Yet, a qualitative change from the middle to the late years can be seen in Leibniz's turn to focus on substance itself as the object of metaphysical reflection. We can notice that while the *Discourse* begins, to put first things first, with a discussion of the perfection of God, the goodness of God, the beauty of God, and the love of God, in the *Monadology*, it is substance that came first in the order of reasons. In the *Monadology*, God is not mentioned until the 29th section and not described until 38th section, a question to be addressed only

[44] [Author's translation] GP IV 292; A II, 1, N. 434; Cf. Fichant, 2004, p. 23.
[45] [Author's translation] A I, 4, N. 407; GP II, 83.
[46] AG 218.

after a robust account of monadic substances had been laid out. The turn to a priority of substances over God in Leibniz's metaphysical project ushers in, in Fichant's view, a genuinely ontological phase.[47] Although Fichant does not give a precise date when this turn takes place, he does suggest that we grasp that this process was already happening through Leibniz's correspondence with Arnauld. Fichant points in particular to Leibniz's letter to Arnauld of 30 April 1687 where he lays out his famous axiom, "*that what is not truly* one *being is not truly one* being *either*."[48] Taking this as the "axiom" that will transform Leibniz's project into a more ontological one, Fichant takes the *Discourse* as already an attempt, although still pulled in different directions, to move toward a deep and prolonged concentration on questions of substance itself. Given that Leibniz still understood his project broadly as a natural theological one, the framework of the *Discourse* was an amalgamation of different attempts to bring notions of substance under one roof. We have already addressed some of the incompatibilities in this text. Clarifying the transformations of this period could provide perspective on why the correspondences with Arnauld contain such rich and divergent topics. In Fichant's reading, it was through these letters that Leibniz attempted to bring his previous metaphysical theses into something that could be understood as an "ontology."

This distinction of metaphysics understood as natural theology and ontology can help us understand crucial missteps in interpreting Leibniz's writings in the middle period. We mentioned three aspects of this natural theology that characterizes his middle period: theological, physical and logical. To take an obvious case, the attempt to read Leibniz's ontology with a priority on logic, like Russell and Couturat have famously done, is flawed precisely in its failure to see that it only constitutes a particular aspect of his metaphysics. This logical aspect will, in the later metaphysics, become subordinated to the more fundamental treatment of substance as metaphysical atom rather than a synthetic unity modeled after the grammatical subject. Likewise, to take Leibniz's treatment of corporeal substance through his reflections on force as a fully ontological thesis would be to make a similar mistake of taking a metaphysical aspect of the middle years for his ontology. In our discussion above on the quandary of primary matter, Leibniz's commitment to the notion of corporeal substance will play a crucial role in his turn toward monads. However the commitment to corporeal substance, at a stage when Leibniz was

[47] Although this does not bear much on the argument here, it is worth noting that in Fichant's view the start of Leibniz's "middle period" should properly be attributed to the 1686 *Discourse on Metaphysics* and his correspondence with Arnauld rather than Garber's view that the 1678 *Conspectus Libelli* is the start. Fichant and Garber roughly agree that the end point is sometime around the turn to the 18th century when simple substances and monads come to the fore.

[48] [Emphasis in the original] AG 87.

still moving from natural theology to a more concrete account of substance, cannot stand in for an ontology.

If this reading, following Fichant, is correct, an ontology in Leibniz was only something that began to build in Leibniz's work around the years following 1686, the years of the *Discourse* and the correspondence with Arnauld. The crucial aspect of this turn can be read in his strict identification of being and unity found in the April 1687 letter to Arnauld. As something like an "ontological axiom", this notion of substance suggests that questions of Leibniz's ontology may be more meaningfully addressed not through the supposed gradients of "realness" ascribed to levels of reality but rather through how the criteria of unity should be fulfilled. Although problems of unity, as Garber sufficiently points out, were already part of Leibniz's reflections leading up to the middle years and beyond, it is in the middle years that this strict identification of unity and being took priority in his metaphysics and hence provided the path towards a full-fledged ontology. In his late period, unity was finally understood as the elemental or constituents of reality, "true atoms of nature," or monads.

Fichant's architectonic interpretation portrays Leibniz as having considered a number of different models for treating the nature of substance, an engagement that guided his development from his middle years to his late years. In this reading, if we were to take a guiding thread through these changes then it would be the different ways in which unity can be expressed that forms the continuity through which something like an ontology emerges from his middle years. As such, seen through an architectonic lens, the problem of unity was not something that was yet resolved in Leibniz's middle years. It was only until the maturation of a monadological vision that the unity of substance could be fully accounted for. An ontological position can only be attributed to Leibniz when he arrived, in his later years, to a monadological substance: a simple substance from which all reality derives its *fundamental* unity. In contrast, during the middle years, different notions of substance coming from theological, logical and physical starting points played conflicting roles in establishing what could be a real "unity." As such, understanding Leibniz's entry into these problems through the project of a "natural theology" makes sense insofar as we could understand how these different models and the different stakes in them correspond to Leibniz's reasoning about created things through their dependence on the nature and being of God. In the late monadic ontological picture, although God is the original monad, God is a monad nonetheless. The ontological account is thus universal insofar as it addresses all existence equally. Whatever is *is* through its unity qua simple substance or monad. In turn, although the nature of God and providence in the nature of created things was never out of place at any point in Leibniz's metaphysics, ontology enters into the picture at the moment when unity or being, rather than God, was taken as fundamental. This universality and

fundamental nature of what Leibniz provides with this later project thus allow us to qualify the monadological vision as genuinely ontological.

VI. Concluding remarks

In the guise of a conclusion, I wish to revisit the problem of prime matter discussed earlier. Our difficulties with this notion were that it could not be placed within the larger hylomorphic hierarchy implied by the model of corporeal substance that Garber wanted to attribute to Leibniz during his middle years. Since a case can only be made against the reductive phenomenalist interpretation by showing that the material aspect of the hylomorphic unity does not somehow reduce to form or mind, it appears that the lack of a "primary matter" conception is a major obstacle for Garber's interpretation. Although Leibniz can be seen as providing the notion of primitive passive force as an account of primary matter, an ontological treatment of the hierarchy of form and matter would place passive force only as something relative to the primitive active force at every successive layer of form-matter composites. To use Garber's "bugs in bugs" analogy, passive force would only account for the smaller bug with respect to the bigger bug to which it is subordinated. Here, matter would still be a "bug" nonetheless; it would only be secondary and not primary matter.

Viewing the problem of Leibniz's ontology from the architectonic view allows us to provide a different understanding of this problem of prime matter. We can see this problem as a conjunction of two separate tendencies in Leibniz both operative in Leibniz's middle years. The first is Leibniz's attempt to provide an account of physical reality that sought to resist the reduction of bodies to mere phenomenal properties. This is his alternative to the Cartesian *res extensa* theory of bodies and matter. Here Leibniz brings together his long standing concerns from theology, that of substantial forms, with his reflections on the nature of corporeal action and resistance. This aspect of his writings can be framed under a natural theological conception of metaphysics. The second tendency is Leibniz's move towards ontology properly speaking. Here the guiding thread is the conception of unity. In this, Leibniz moves from a synthetic sense of unity towards an elemental sense of simple monadic unities. When Leibniz begins to prioritize bottom-up conceptions of reality by beginning with absolute simples that build toward more complex wholes, the problem of searching for a "bottom" for his earlier top-down synthetic notion of unity naturally dissolves. Indeed, Garber himself recognizes that only with the later monadological vision could a primary matter notion and its accompanying primitive passive force be given its own role in the map of reality.

From this perspective, the importance of Garber's arguments against a reductively phenomenalist interpretation of Leibniz's middle years is in its laying out fundamental and qualitative differences in latter's conception of

substance. Much of this compels us to accept that Leibniz was indeed, in the middle period, working with a conception of corporeal substance, irreducible to minds, such that it would be incompatible with the way that all of reality could be reducible to monads in the later period. Yet the problem with this interpretation begins when we attempt to build up this account of corporeal substance as something ontological. As I have tried to argue, borrowing from Fichant's architectonic reading, the first flaw in this attempt is that the various models through which Leibniz worked on this problem of substance can be shown to be incomplete. Leibniz could be said to have been running a "workshop" of metaphysics in his middle years, with a number of different and independent metaphysical projects whose results could only be made consistent at a later date. As such the second flaw with this attempt to demonstrate an ontology in Leibniz's middle years is that the latter could not be said to have one. Again here, the late Leibniz shows what a genuine ontology is supposed to look like. It provides a universal and fundamental account of being qua being by prioritizing simplicity as the interpretation of the unity of substance. This and only this could be qualified as ontological. Leibniz in his middle years was already in the process of moving toward such a position but was far achieving his eventual solution. His metaphysics was still a series of different approaches for giving an account of causes. This is indeed natural theology or metaphysics understood as "first philosophy" where the origin and absolute cause and being of reality, the proper object of metaphysical inquiry, was still a particular kind of substance, God. In this way, we might say that there was no non-idealist ontology in Leibniz simply because Leibniz never had a genuine ontology until he became fully idealist.

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REVIEW ARTICLE

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The Toolbox of the Early Modern Natural Historian: Note-Books, Commonplace-Books and the Emergence of Laboratory Records

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Ann M. Blair, *Too Much to Know: Managing Scholarly Information before the Modern Age*, New Haven: Yale University Press, 2010, 397 pp.
Ann Moss, *Printed Commonplace-Books and the Structuring of Renaissance Thought*, Oxford: Clarendon Press, 1996, 358 pp.
Richard Yeo, *Notebooks, English Virtuosi, and Early Modern Science*, Chicago: University of Chicago Press, 2014, 384 pp.

Natural history was a prominent enterprise in early modern Europe. It came under a variety of forms and genres, and natural historians often followed different models and traditions.[1] But regardless of this diversity, a general interest in historical research permeated branches of knowledge as different as

[1] For a discussion of Aristotelian and Plinian models of natural history see Gianna Pomata, "*Praxis Historialis*: The Uses of *Historia* in Early Modern Medicine," in Gianna Pomata and Nancy G. Siraisi (eds.), *Historia: Empiricism and Erudition in Early Modern Europe,* Cambridge, Mass.: MIT Press, 2005, pp. 105-146; Laurent Pinon, "Conrad Gessner and the Historical Depth of Renaissance Natural History," in *ibid*., pp. 241-267. See also Paula Findlen, "Natural History," in Lorraine Daston and Kathrine Park (eds.), *The Cambridge History of Science. Volume 3: Early Modern Science*, Cambridge: Cambridge University Press, 2006, pp. 435-469; Roger French, *Ancient Natural Histories: Histories of Nature*, London: Routledge, 1994. Following French, I have also discussed an alternative model of natural historical writing which I called "Senecan natural history." See Dana Jalobeanu, "Francis Bacon's Natural History and the Senecan Natural Histories of Early Modern Europe," *Early Science and Medicine* 17 (2012), pp. 197-229.

medicine and astronomy, natural philosophy and the mechanical arts. What scholars have called "the ubiquity of *historia* in early modern learning"[2] had two interesting consequences. The first was called "learned empiricism," and referred to the propensity of the early moderns to investigate nature with the textual and philological tools characteristic of humanist historical research.[3] Sixteenth-century naturalists and cosmographers, doctors and natural philosophers were, first and foremost, humanists: they had the ability to switch "nimbly back and forth between book and direct observation"[4] and quite often their natural historical observations had "historical depth."[5] Recent investigations have also addressed the subtle interplay between the humanists' ethical conception of *historia* and the rise of "empiricism,"[6] and between the therapeutic and moral aspects of historical research, on one side, and the emergence of observation and experimentation on the other.[7]

Meanwhile, the sixteenth century saw the emergence of a large set of novel practices and research tools *common* to what we would call today "natural" and "human sciences."[8] This new set of tools comprised reformed methods of reading and writing, gathering and managing information, as well as new practices of observation, description, recording and sharing empirical knowledge. Some

[2] Gianna Pomata and Nancy G. Siraisi, "Introduction," in Pomata and Siraisi, *Historia*, pp. 1-38, at p. 1.

[3] This is how Pomata and Siraisi characterize "learned empiricism:" "There is no doubt that the empiricism of the early modern *historia*, in all of its varieties, must be qualified as erudite or textual in nature. Direct observation was preceded and accompanied by laborious compilation, based on the culling of information from earlier texts. In natural history and medicine, for instance, the paleographical and philological study of manuscripts and the empirical investigations of plants, animals and diseases were often related aspects of the same activity. Empirical observation and philological reconstruction complemented one another […]." *Ibid*., p. 17. See also William B. Ashworth, "Emblematic Natural History in the Renaissance," in Nicholas Jardine, J.A. Secord, and Emma C. Spary (eds.), *Cultures of Natural History*, Cambridge: Cambridge University Press, 1996, pp. 17-37.

[4] Pomata and Siraisi, "Introduction," p. 25.

[5] Pinon, "Conrad Gessner and the Historical Depth of Renaissance Natural History," pp. 263-264.

[6] See Brian Ogilvie, "Natural History, Ethics, and Physico-Theology," in Pomata and Siraisi, *Historia*, pp. 75-103.

[7] See some of the articles in Sorana Corneanu, Guido Giglioni, and Dana Jalobeanu (eds.), *Francis Bacon and the Transformation of Early Modern Natural History*, special issue of *Early Science and Medicine* 17 (2012).

[8] Gianna Pomata and Nancy Siraisi claim that the lack of clear-cut boundaries between the study of nature and the study of culture is one of the salient features of early modern encyclopedism: "The early modern *historia* seriously challenges our assumptions about nature and culture as separate fields of inquiry […]. Early modern *natura* and *historia* were not antithetical terms, nor were the boundaries between them drawn as we draw them now. Precisely because the contrast with nature is at the very core of our conception of history, it is often misleading to translate as 'history' the early modern term *historia*, which often referred to natural objects." Pomata and Siraisi, "Introduction," pp. 5-6.

of these new practices and methods have attracted considerable attention in the past decades. Some scholars have emphasized parallels between early modern ways of observing and ways of reading,[9] and between the practice of excerpting and quoting and the "fragmentation of experience into facts."[10] Ongoing investigations in the history of science, the history of the book and the cultural history of information have traced the history of note-taking and commonplacing in the Renaissance, bringing to light a complex interplay between print and manuscript cultures.[11] More recently, a whole stream of books and articles have provided in-depth investigations of the various ways in which techniques of compilation, abridgment and excerpting initially developed in the Middle Ages evolved during the sixteenth century in response to new challenges, such as the "information overload,"[12] a changing attitude towards authority, [13] and various forms of "factual" or "empirical sensibility."[14] My purpose in this review article is to discuss some of these recent scholarly achievements. Central to my analysis are three books which, in many ways, complement each other: Ann Moss's comprehensive history of commonplace-books, developed in her *Printed Commonplace-Books and the Structuring of Renaissance Thought* (1996), Ann Blair's brilliant investigation of humanist research techniques developed to cope with "information overload," in her relatively recent *Too Much to Know: Managing Scholarly Information before the Modern Age* (2010) and Richard Yeo's very recent discussion of early modern note-taking, in his *Notebooks, English Virtuosi, and Early Modern Science* (2014).

[9] See Ann Blair, "*Historia* in Zwinger's *Theatrum humanae vitae*," in Pomata and Siraisi (eds.), *Historia*, pp. 283-285; Pomata and Siraisi, "Introduction," pp. 20-21.

[10] Lorraine Daston, "Marvelous Facts and Miraculous Evidence in Early Modern Europe," *Critical Inquiry* 11 (1991), pp. 93-124. See also Pomata and Siraisi, "Introduction," pp. 21-22; Ann Blair, "*Historia* in Zwinger's *Theatrum humanae vitae*," p. 289.

[11] Harold Love, *The Culture and Commerce of Texts: Scribal Publication in Seventeenth-Century England*, Amherst, Mass.: University of Massachusetts Press, 1998; Elizabeth Yale, "Marginalia, Commonplaces, and Correspondence: Scribal Exchange in Early Modern Science," *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 42 (2011), pp. 193-202; Ann Blair, "Humanist Methods in Natural Philosophy: The Commonplace Book," *Journal of the History of Ideas* 53 (1992), pp. 535-539; Ann Moss, *Printed Commonplace-Books and the Structuring of Renaissance Thought*, Oxford: Clarendon Press, 1996; Ann Blair, *The Theater of Nature : Jean Bodin and Renaissance Science*, Princeton, NJ: Princeton University Press, 1997.

[12] Richard Yeo, "Between Memory and Paperbooks: Baconianism and Natural History in Seventeenth Century England," *History of Science* 14 (2007), pp. 1-47; Yeo, *Notebooks, English Virtuosi, and Early Modern Science*, Chicago: University of Chicago Press, 2014; Ann Blair, *Too Much to Know: Managing Scholarly Information before the Modern Age*, New Haven: Yale University Press, 2010.

[13] Ian McLean, *Logic, Signs and Nature in the Renaissance*, Cambridge: Cambridge University Press, 2002; Pomata, "*Praxis Historialis*: The Uses of *Historia* in Early Modern Medicine."

[14] Yeo, *Notebooks, English Virtuosi, and Early Modern Science*; Lorraine Daston, "The Factual Sensibility," *ISIS* (1988), pp. 452-467.

My analysis focuses on some of the interesting points of contention between the three authors. The first part of this essay deals with their respective conflicting views on the causes of the early modern "information overload." The second part evaluates their respective claims regarding the alleged decline and transformation of the commonplace method. In the third part of this essay I address the question of the interplay between note-taking, memory and the early modern understanding in the particular context of the early modern natural history.

My general claim is that Moss, Blair and Yeo provide important contributions to our current understanding of the toolbox of the early modern natural historian. They give us a fuller picture of the evolution and transformation of various techniques for gathering information, from the art of excerpting to that of making laboratory records. They also raise interesting (and sometimes unsolved) questions regarding information management, collaboration and learning in the early modern culture of "empiricism."

The information explosion

Early modern natural history offers a remarkable illustration of what Ann Blair has called the "information explosion." Brian Ogilvie has convincingly illustrated this information explosion in botanical knowledge. His investigations of botanical collections show a sheer increase in mass: from the 500 species of plants described by Dioscorides to over 6000 species of plants featuring in the herbals and botanical "theatres" of the early seventeenth century.[15] Similar exponential increases of information have been detected by historians of cosmography, *materia medica*, husbandry, natural philosophy and natural magic.[16] Scholars have considered this information explosion to be a direct consequence of geographical explorations and the rediscovery of ancient texts.[17] Blair and Ogilvie explicitly contradict this explanation. They show that the exponential increase in "factual" knowledge is the result of a new attitude towards "seeking out and stockpiling information"[18] in both empirical

[15] Brian W. Ogilvie, *The Science of Describing: Natural History in Renaissance Europe*, Chicago: University of Chicago Press, 2006, p. 230.

[16] Gianna Pomata, "Observation Rising: Birth of an Epistemic Genre, 1500-1650," in Lorraine Daston and Elizabeth Lünbeck (eds.), *Histories of Scientific Observation*, Chicago: University of Chicago Press, 2011, pp. 45-80; Matthew Adam McLean, *The Cosmographia of Sebastian Münster: Describing the World in the Reformation*, London: Ashgate, 2007.

[17] See for example some of the articles in James Fleming (ed.), *The Invention of Discovery: 1500-1700*, London: Ashgate, 2011.

[18] Blair, *Too Much to Know: Managing Scholarly Information before the Modern Age*, p. 12. Ogilvie has shown that by the end of the sixteenth century, natural history became a "science of describing," characterized by by the development of a "sophisticated technology of observation and description," which combined in a characteristic manner textual descriptions of species with a "scientific," imagistic representation of the object described. The resulting new histories

and textual research. For Blair, this new attitude was characterized by a novel enthusiasm for accumulation and stockpiling (books, notes, but also collections of artefacts)[19] and a constant attempt to safeguard information. This, she claims, led to a "stockpiling approach to note-taking," and to the emergence of large collections of notes in the early modern period. She claims that the same impulse to gather and preserve information led to the publication of these large collections of notes which eventually became the massive reference books so characteristic of the late sixteenth century. The result was the "information overload." Unlike the commonplace books of the ancients, or the collections of excerpts of the medievals, early modern collections of notes "were valued as treasuries or storehouses in which to accumulate information even if they did not serve an immediate purpose."[20] These large collections posed new problems regarding the recording, storage, sharing and retrieval of information. They eventually led to a refining of old techniques of compiling and excerpting, and to the development of new methods of commonplacing, directed towards the better management and retrieval of information. Meanwhile, Blair convincingly shows that most such research methods and tools were merely an improvement of previous techniques of reading and writing, already developed in the Middle Ages. The system of heads, the use of indexes, even the sharing of notes are not, Blair claims, early modern inventions. What the early moderns did was merely face a more severe form of "information overload" than any of the previous generations of scholars.

Richard Yeo's approach to the problem of information overload is slightly different. First, he ascribes the early modern information explosion more explicitly to the emergence of large scale projects of natural history. More precisely, Yeo claims that the English virtuosi's pursuits of Baconian natural history led to information overload and triggered subsequent developments

of plants were the result of specialized field observation, written in what we would call today a "technical jargon," and addressed to colleagues and peers. The trademark of this specialized language was the particular recording of the 'specialized observation.' This was done in terms of *relevant features* of the phenomenon observed, and particular *differentiae* of the object (species) investigated with respect to others of the same genre. The exponential increase in the species of plant was precisely due to the increased attention to details required by the specialized observation. See Ogilvie, *The Science of Describing: Natural History in Renaissance Europe*, pp. 209ff.

[19] Blair claims that: "The stockpiling of notes was part of a larger cultural phenomenon of collecting and accumulating in early modern Europe that generated not only textual compilations in manuscript and print but also collections of natural and artificial objects, from plants and minerals to medals, paintings, and "curiosities." […] In the case of textual compilations, a renewed awareness of the loss of ancient learning and the desire to forestall future losses motivated some abundant compilers. […] Printing, along with improvements in postal systems, likely heightened the sense scholars had of working toward the common good of an international Republic of Letters, notably through the formal and informal circulation of information." Blair, *Too Much to Know: Managing Scholarly Information before the Modern Age*, p. 64.

[20] *Ibid.*, p. 63.

of novel methods and techniques for managing information. Yeo's book is an impressive survey of natural historical projects extending from the large scale compilations of information produced in the Hartlib circle in the 1650s, to the collective projects of making "faithful Records of all the Works of Nature, or Art" undertaken by the early Royal Society, and from Beale's attempts to revive the art of memory to Locke's notebooks and theory of note-taking. His claim is that all these projects have in common a "Baconian model" of research; and that each of them eventually reads as an attempt to solve, in its own way, the challenge of information overload.[21] Although attempted solutions might look different—ranging from the cut-and-paste methods of organizing information advocated by Hartlib to the "Harrisonian indexes," and from the "Repository" of the early Royal Society to Hooke's "philosophical algebra"—Yeo claims that they are all variations on the same theme: that of a well-organized, "Baconian" discipline of note-taking.

Yeo's "Baconian models" are hard to disambiguate. After all, as has been shown time and again, there are many ways of being Baconian in the seventeenth century;[22] and there are many ways in which the virtuosi themselves read and practised different forms of Baconianism(s). For some, large scale "Baconian" natural histories were merely a *desideratum*; others took Bacon's method of natural history more seriously. While for some Bacon's natural historical research became a pattern, for others it was merely a stockpile of unfinished notes to be continued. Or, to use Yeo's example, while Ralph Austen or Robert Boyle took Bacon's *Sylva Sylvarum* as a "model for empirical inquiries,"[23] Joshua Childrey modelled his note-taking strategies after Bacon's theory of note-taking.[24] It would be fair to say that Yeo's investigation is particularly interested in the latter pursuit of a "Baconian model," i.e., in Bacon as the "mentor on note-taking for the English virtuosi."[25] Meanwhile, as Yeo correctly emphasizes, Bacon "did not provide detailed guidance on note-taking:"

[21] Chapter 3 of Yeo's book nicely exposes the problem: it claims that in setting themselves the task of gathering Baconian natural histories, the virtuosi faced a special kind of information overload, arising from the combined effect of new bookish techniques of reading and writing and what Yeo calls "the empirical sensibility." The virtuosi are seen as facing an increasingly messy world of "information." Yeo, *Notebooks, English Virtuosi, and Early Modern Science*, Chapter 3.

[22] Here is a sample of recent and less recent books and articles dealing with this notoriously difficult issue: Guido Giglioni, "How Bacon Became Baconian," in Sophie Roux and Daniel Garber (eds.), *The Mechanization of Natural Philosophy,* Boston Studies in the Philosophy and History of Science, Dordrecht: Springer, 2013, pp. 27-54; Dana Jalobeanu, *The Art of Experimental Natural History: Francis Bacon in Context*, Bucharest: Zeta Books, 2015; Michael Hunter and Paul B. Wood, "Towards Solomon's House: Rival Strategies for Reforming the Early Royal Society," *History of Science* 24 (1986), pp. 49-108; William Lynch, *Solomon's Child: Method in the Early Royal Society of London*, Stanford: Stanford University Press, 2001.

[23] Yeo, *Notebooks, English Virtuosi, and Early Modern Science*, p. 221.

[24] *Ibid*., pp. 222-223.

[25] *Ibid*., p. 255.

> Bacon's pronouncement supplied a touchstone, a point of reference for those thinking about note-taking in the sciences; however, they did not constitute and easy-to follow script on the question of how best to combine reliance on memory, notes, and permanent records.[26]

At least in part, the ambiguities of "Baconian natural history" originate in Bacon's own writings.[27] One can take Baconian natural history to refer to a method of gathering and recording "instances," i.e., observations and experiments, in a more or less ordered structure of titles (heads).[28] One can also take Baconian natural history to refer to the results obtained through this process of gathering, i.e., large scale compilations of observations, experiments, methodological advice and sometimes straightforward theoretical axioms.[29] But Yeo refers much more often to Baconian models of note-taking and commonplacing, i.e., to Bacon's theory of note-taking. This theory consists of a series of observations and advice scattered throughout Bacon's writings, dealing with how to record, select and rearrange materials gathered from books, personal experience, travel reports, sophisticated experimentation or mere hearsay in well-organized note-books intended to help the process of discovery. A number of recent scholarly investigations have attempted to unearth the basic elements of Bacon's theory and practice of commonplacing; but one has the feeling that what we have seen so far is merely the tip of the iceberg.[30] Much more research is needed in order to understand how Bacon's theory of commonplacing relates to his practice of natural history.[31]

[26] *Ibid.*, p. 225

[27] See Jalobeanu, "Francis Bacon's Natural History and the Senecan Natural Histories of Early Modern Europe."

[28] On Bacon's method of natural history see Peter Anstey, "Francis Bacon and the Classification of Natural History," *Early Science and Medicine* 17 (2012), pp. 11-31; Peter R. Anstey, "Philosophy of Experiment in Early Modern England: The Case of Bacon, Boyle and Hooke," *Early Science and Medicine* 19 (2014), pp. 103-132; Jalobeanu, *The Art of Experimental Natural History: Francis Bacon in Context*.

[29] This is what scholars traditionally referred to when writing about Bacon's natural history: large-scale compilations of "facts," observations and experiments. See for example Paula Findlen, "Francis Bacon and the Reform of Natural History in the Seventeenth Century," in D.R. Kelley (ed.), *History and the Disciplines: The Reclassification of Knowledge in Early Modern Europe*, Rochester: University of Rochester Press, 1995, pp. 239-261; Lorraine Daston, "Baconian Facts, Academic Civility, and the Prehistory of Objectivity," *Annals of Scholarship* 8 (1991), pp. 337-363.

[30] See Alan Stewart and Harriet Knight, "Introduction," in Alan Stewart and Harriet Knight (eds.), *Francis Bacon: Early Writings, 1584-1596, The Oxford Francis Bacon*, Oxford: Clarendon Press, 2013; Angus Vine, "Francis Bacon's Composition Books," *Transactions of the Cambridge Bibliographical Society* (2008), pp. 1-31; Vine, "Francis Bacon, the Waste-Book, and the Ledger," *English Manuscript Studies 1100-1700* 16 (2011), pp. 197-218.

[31] For some attempts to unearth the complex inter-relations between Bacon's note-taking methods and the resulting natural histories see Cesare Pastorino, "Weighing Experience: Francis Bacon, the Inventions of the Mechanical Arts, and the Emergence of Modern Experiment,"

Yeo agrees with Moss and Blair that Bacon attempted a complete reform of the traditional method of commonplacing; that he changed both the traditional structure of heads and the techniques of recording, and that he extended the field of investigations from books to the realm of nature. He also indicates that this theory of note-taking is bound somehow with the method of natural history, as well as with the larger, more comprehensive, natural historical "model." However, the details of this interesting reconstruction are sadly missing, partly because—somewhat surprisingly—Yeo's book does not contain a separate chapter on Bacon. The reader has to work out for herself most of the details of Bacon's attempt to construct a novel theory (and practice) of note-taking "suitable for empirical natural history" and "more rigorous and better managed than the usual commonplacing of his day."[32]

Reforming the commonplace-book and the emergence of shared laboratory notebooks

Francis Bacon regarded note-taking techniques as crucial for his project of building natural histories. And his theory of note-taking reads as an interesting project of reformation of the traditional, humanist commonplace book. He replaced the traditional system of "Heads" with a system of questions, queries and "Topics of Inquiry." As Ann Moss has shown, this meant a complete rethinking of the traditional concept of "place." Bacon's heads are not rhetorical places of proof, but places of invention: open-ended questions addressed to nature. [33] Although to the inattentive eye this looks like commonplacing, it might be something entirely different. Moss claims:

> The new places of enquiry will discover pathways for new work, rather than strategies for defence; axioms, not arguments; and the manner of communicating such knowledge will not be discursive prose, but a succession of discrete aphorisms […]. Superficially, we are still in the world of the commonplace-book. The book of the new science will consist of a copious number of pithy aphorisms or *sententiae* assembled under 'places' of enquiry, and such 'places' will be ordered for purposes of comparison under 'tabulae,' or in sets corresponding to divisions within the various subjects of investigation in the world.[34]

Early Science and Medicine 16 (2011), pp. 542-570. For interesting examples of Bacon's handling of sources see Doina-Cristina Rusu, "From Natural History to Natural Magic: Francis Bacon's *Sylva Sylvarum*," PhD Diss., Radboud University, 2013; Dana Jalobeanu, "Bacon's Apples: A Case-Study in Baconian Experimentation," in Guido Giglioni, James A.T. Lancaster, Sorana Corneanu and Dana Jalobeanu (eds.), *Motion and Power in Francis Bacon's Philosophy*, Dordrecht: Springer, 2015 (forthcoming).

[32] Yeo, *Notebooks, English Virtuosi, and Early Modern Science*, pp. 24-25.

[33] Moss, *Printed Commonplace-Books and the Structuring of Renaissance Thought*, p. 270.

[34] *Ibid*., pp. 270-271.

Yeo also argues for the "open-ended" character of Bacon's method of note-taking, showing how it successfully combines traditional techniques of commonplacing with various other ways of recording, testing and verifying empirical information. For Yeo, Bacon's reformation of commonplace books is more profound than a mere replacement of the system of heads and the free mixing of bookish and "laboratory" information. Its key point resides in a different understanding of the notion of information, marked by what Yeo calls "the empirical sensibility."[35] Bacon's method of assembling catalogues of "particulars" requires ordering, trying and testing of the composing instances; and this, according to Yeo, is done by means of what Bacon calls *experientia literata* (literate experience). Francis Bacon's literate experience is a notoriously difficult concept, much discussed in Bacon scholarship;[36] and Yeo's interpretation of it is interesting and enticing. Unfortunately, neither his claim that *experientia literata* means "the assembling of preparatory information, sorted in various ways to assist memory and thinking,"[37] nor his subsequent claims that Oldenburg and Sprat used schemes of gathering and ordering information similar with Bacon's literate experience[38] are substantiated by thorough argumentation.

Yeo's emphasis on the recording aspects of literate experience is partly motivated by his attempts to connect note-taking and information management with memory, and the various transformations taking place in the theory of retaining, managing, retrieving and recollecting items from an "internal" and an "external" memory. One of the important claims of his book is that Bacon's reformation of the commonplace method shifted the

[35] Yeo claims that Bacon and his followers saw the complex process of note-taking as more than merely a gathering of information; items gathered had to be assessed and checked against each other on a model similar with the early modern theory of sense perception. See Yeo, *Notebooks, English Virtuosi, and Early Modern Science*, Chapter 3.

[36] A fair sample of scholarly interpretations of Bacon's notion of literate experience comprises: Lisa Jardine, "*Experientia literata* or *Novum organum*? The Dilemma of Bacon's Scientific Method," in William A. Sessions (ed.), *Francis Bacon's Legacy of Texts: "The Art of Discovery Grows with Discovery"*, New York: AMS Press, 1990, pp. 47-67; Sophie Weeks, "The Role of Mechanics in Francis Bacon's Great Instauration," in Gisela Engel, Claus Zittel, Romano Nani, Nicole C. Karafilys (eds.), *Philosophies of Technology: Francis Bacon and his Contemporaries,* Intersections: Yearbook for Early Modern Studies 11, Leiden: Brill, 2006, pp. 133-196; Rhodri Lewis, "A Kind of Sagacity: Francis Bacon, the *ars memoriae* and the Pursuit of Natural Knowledge," *Intellectual History Review* 19 (2009), pp. 155-177; Lewis, "Francis Bacon and Ingenuity," *Renaissance Quarterly* 67 (2014), pp. 113-163; Guido Giglioni, "Learning to Read Nature: Francis Bacon's Notion of Experiential Literacy (Experientia Literata)," *Early Science and Medicine* 18 (2013), pp. 405-434; Dana Jalobeanu, "Core Experiments, Natural Histories and the Art of *Experientia literata*: The Meaning of Baconian Experimentation," *Societate si Politica* 5 (2011), pp. 88-104; Laura Georgescu, "A New Form of Knowledge: Experientia Literata," *Societate si Politica* 5 (2011), pp. 104-121.

[37] Yeo, *Notebooks, English Virtuosi, and Early Modern Science*, p. 84.

[38] *Ibid*., pp. 86-87.

accent of note-taking from recollection to information retrieval. Following Bacon, mid-seventeenth-century virtuosi no longer used commonplace books as "tools for prompting recollection, still less citations," but as "personal databases from which information […] could be retrieved and followed up." Consequently, the organization of early modern note-books (whether bookish collections or collaborative laboratory projects) was mainly directed by systems of indexing and ascribing "tags" for each particular entry. Again, Yeo's book contains a remarkable number of examples; he analyses notebooks and commonplace books coming from the mid-seventeenth-century Baconians of the Hartlib circle, works and papers of the founding members of the Royal Society, various communitarian, large-scale projects such as the "repository" of the Royal Society, or various seventeenth-century designs for building up a large scale, "European" natural history. His examples contain successful projects and large-scale failures; merely sketched natural histories and full blown collaborative note-taking. And although Yeo makes several attempts to classify them with respect to the theory of note-taking and their relation to memory, his classification fails to explain why some collaborative note-taking projects proved successful while others amounted to unmanageable stockpiles of information.

Ann Blair's investigation of early modern reference books also addresses the question of collaborative note-taking. Blair sometimes equates the massive reference books of the late Renaissance with collections of notes, claiming that the appeal of these massive compilations resided in the fact that they were simply collections of notes made available to a wider audience.[39] She claims that none of the basic research techniques of compilers was an early modern invention; what the early moderns did was merely compile information on a larger scale. The recording, arrangement and managing of information was still handled with the traditional method of heads and indexes already in place in the thirteenth century. Neither was collaboration in note-taking an early modern discovery. What was modern was the scale of the phenomenon: Blair claims that early modern note-taking was essentially collaborative; that "compilers relied on the help of others not only diachronically but also synchronically, at the moment of the composition."[40] Blair's investigation unveils some such helpers; they seemed to have subordinate positions as amanuenses, students, members of one's family and household. Unlike Yeo's examples of collaboration amongst peers, Blair's massive compilations seem to follow a different pattern: a master-mind compiler uses subordinate help to amass and sort out information, to copy and write down records, etc. Meanwhile, some of this primary information comes from correspondence and intellectual in-

[39] Blair also claims that the popularity of such reference books can be measured by the way they became models to be imitated in various sets of manuscript notes. See Blair, *Too Much to Know: Managing Scholarly Information before the Modern Age*, pp. 248-249.

[40] *Ibid.*, pp. 209-210.

teractions with other natural historians, or other compilers. But even in those cases, there is always one person in charge: the author-compiler is responsible for the order and organization of information in the published collection of notes. Yeo's problem of retrieving information features prominently in the examples formulated by Blair. With a few notable exceptions, Blair's examples of reference works were not meant to be read from the beginning to the end. They played the role of source-books of excerpts, quotes, authoritative information and exempla, "materials for the building" of natural history, natural philosophy, cosmography, theological treatises, sermons, etc.[41]

Size matters: memory, learning and information retrieval

One of the most interesting questions raised by both Blair and Yeo is that of scale. What was the point at which large scale compilations became truly unmanageable? When (and why) did the commonplace system of heads break into merely alphabetical ordering? What kind of collaborative projects worked and which were too large to manage? To what extent was note-taking truly collaborative?

As Yeo shows, gathering Baconian natural histories posed serious problems of recording and managing information; but, most of all, it raised the early moderns' awareness of the difficult problem of information retrieval. Yeo's suggestion is that collaborative projects of note-taking were organized according to two general schemes/methods, which, in turn, related to memory. The first method aimed at comprehensiveness and developed subsequent instruments for tagging and indexing records. These were the large-scale projects of institutional note-taking,[42] such as the Royal Society's "repository." These institutional projects were designed to function as external memories for the collective body which was gathering them. The second method followed a more sophisticated, two-stage Baconian model in which gathering and registering information was doubled by various "philosophical shortcuts" destined to abridge, to generalize, to form axioms and laws. This method preserved some of the ideals of the traditional commonplace book; it aimed at organizing information in such a way as to make recollection (and judgment) possible. This Baconian model of note-taking was directed towards discovery; it was organized so that it could facilitate ratiocination and understanding. Meanwhile, as Yeo emphasizes, this way of organizing information makes the retrieval of input information much more difficult.

In the last chapter of his book, Yeo convincingly argues that Robert Hooke's proposal of a philosophical natural history was directed by such a Baconian model: it aimed to design a "dynamic archive," combining the external

[41] *Ibid*., pp. 237, 244-235.

[42] Yeo, *Notebooks, English Virtuosi, and Early Modern Science*, p. 230.

memory (a natural historical repository) with an organization destined to aid and prompt the internal memory. This amounted to organizing information in such a way as to facilitate "shortcuts," of recollection and understanding. [43]

Unfortunately, Hooke's dynamic archive was never finished. But neither were any of the large-scale institutional projects of collaborative note-taking, at least not until the end of the seventeenth century. Does this mean that the virtuosi were simply defeated by information overload?

As Yeo clearly emphasizes, collaborative note-taking is an important aspect of modern science. The collection, organization and storage of information in notes, letters, papers and journals were key factors in the consolidation of science. As Yeo indicates, by the end of the eighteenth century, standard procedures were in place for note-taking, gathering and organizing archives and information retrieval.[44] However, in the second generation of Baconians, the new science was not sufficiently institutionalized; it lacked both the "archives" and the protocols for storing and using them. Therefore, it is not surprising that most of Yeo's examples of collaborative projects are largely failed attempts.

However, there is at least once success story among Yeo's examples of collaborative note-taking. It is the example of "sharing notes among friends," i.e., the natural historical projects of John Ray, John Willughby and Martin Lister who freely used each-other's notes.[45] These three naturalists went beyond theorizing the collaborative character of note-taking; they were putting it into practice. They compared notes on similar observations, shared questions and answers with respect to particular phenomena, provided their colleagues with missing data and information. Moreover, this project of collaborative note-taking led to concrete (and important) results.[46]

Yeo might have offered other examples of seventeenth-century success stories. John Beale and John Evelyn's horticultural projects fall under the same category. For example, Evelyn's *Pomona or an Appendix Concerning Fruit Trees in Relation to Cider: The Making and Several Ways of Ordering* It (1664)[47] reads very much as the published result of a collaborative project dealing with the

[43] As Yeo shows, it is quite difficult to reconstruct this part of Hooke's project. All that we know from contemporary comments is that this stage of note-taking and managing information involves, in some way, a "Philosophick Algebra." See *ibid*., pp. 247-248.

[44] *Ibid*., pp. 253.

[45] *Ibid*., pp. 230-235.

[46] The publication of John Ray, *Catalogus plantarum circa Cantabirgiam nascentium*, Cambridge: J. Field, 1660 and Martin Lister, *Historiae animalium anglicae tres tractatus*, London: J. Martyn, 1678. John Ray also published *Observations Topologica, Moral and Physiological*, presumably a result of common observations made in England as well as in their voyages throughout Europe. Ray inherited Willughby's manuscripts and was planning to write a "general history of nature." *Ibid*., p. 234.

[47] John Evelyn, *Sylva, or A Discourse of Forest-Trees, and the Propagation of Timber in His Majesties Dominions*, London: Printed by Jo. Martyn & Ja. Allestry, 1664.

improvement of English orchards and the making of cider.[48] *Pomona* contains John Beale's aphorisms for producing cider, two papers by Paul Neile and some other recipes and excerpts relating to the production of cider, as well as some excerpts from Columella's *Calendarium hortensius*. The project of making cider began with a collection of notes, letters and papers sent to the Royal Society and continued with several publications in *Philosophical Transactions.* It involved numerous exchanges and collaborative compiling of information, and ended up in what is, to all practical purposes, one of the first collective "scientific" volumes of the mid-seventeenth century. As in Yeo's example, this collective project was designed on a relatively small-scale, as "note-sharing among friends." It was also quite well defined, both theoretically and methodologically. And as in Yeo's example, it was a success story of the collaborative note-taking and managing information on the verge of the "scientific revolution."

These examples of collaborative note-taking have many things in common, besides their size. True, they are relatively small in comparison with the other large-scale institutional projects of the early Royal Society. But they also share a common vocabulary, common questions, common goals and expectations, and, presumably, some more (theoretical) background knowledge. Naturalists engaged in common explorations of nature, sharing questions, and sometimes much background knowledge, could also successfully share their notes. They could also collaborate in the very process of note-taking. In other words, it seems to me that note-sharing mainly worked if the actors involved were actually working on well-defined common projects: cataloguing plants, making records of their European travels, improving the English orchard, sharing recipes for the production of cider; or simply studying a particular set of natural phenomena. What makes a pile of notes intelligible is not the system of heads and accompanying indexes; it is primarily the shared background knowledge and the common questions to which the naturalists attempted to respond. Size matters, indeed; but the question of scale does not apply to the stockpile of notes. It applies to the size and intelligibility of the associated theoretical questions which direct the natural historical investigations.

But if this is indeed the case, perhaps one should make more room for a discussion of note-taking in relation not only with memory, but also with judgment and understanding. As Moss has already remarked, Bacon's reformation of the method of commonplaces involved a radical redefinition of heads and "places," which became topics of inquiry, i.e., research questions. For Bacon, research questions fulfilled many functions. They were used to organize the

[48] On this, see Peter H. Goodchild, "'No Phantasticall Utopia, but a Reall Place'. John Evelyn, John Beale and Backbury Hill, Herefordshire," *Garden History* (1991), pp. 105-127; Mayling Stubbs, "John Beale, Philosophical Gardener of Herefordshire: Part I. Prelude to the Royal Society (1608–1663)," *Annals of Science* 39 (1982), pp. 463-489; Stubbs, "John Beale, Philosophical Gardener of Herefordshire: Part II. The Improvement of Agriculture and Trade in the Royal Society (1663–1683)," *Annals of Science* 46 (1989), pp. 323-363.

inquiry; but they also played an important role in directing the understanding in the process of discovery. Moreover, in addition to this dynamic and provisional system of heads, Bacon's theory of commonplaces emphasizes the importance of "transporting" items from one context to another.[49] Similarly, Bacon's natural histories make copious use of multiple recordings. Observations and experimental results are often recorded under different heads, rearranged in lists and tables and are sometimes used to obtain intermediate results, i.e., axioms of increasing generality.[50] I think that Yeo's reconstruction of this dynamic process of recording and using information in terms of recollection and information retrieval is too restrictive, and that, for Bacon, as well as for some of his followers, note-taking was an important part in directing and educating the understanding.

Conclusion

Ann Moss has suggested an interesting way of approaching the history of the commonplace-book, through the celebrated Senecan metaphor of the bees. Here is how Seneca's text reads:

> We […] ought to copy these bees, and sift whatever we have gathered from a varied course of reading, for such things are better preserved if they are kept separate; then, by applying the supervising care with which our nature has endowed us, - in other words, our natural gifts, - we should so blend those several flavours into one delicious compound that, even though it betrays its origin, yet it nevertheless is clearly a different thing from that whence it came. […] We must digest it; otherwise it will merely enter the memory and not the reasoning power.[51]

As Moss has shown, this paragraph was widely read, quoted and interpreted. And interpretations could vary substantially. Some authors shifted the emphasis from learning, digesting and the production of knowledge to mere ordering and reshuffling of information. Others did precisely what Seneca tried to prevent his readers from doing, i.e., focus almost exclusively on memory, recollection and information retrieval. Francis Bacon made ample use of the bee metaphor; in fact, he made it the emblem of his views on the advancement of learning. For Bacon, to imitate bees meant to pursue a process of gathering, organizing and managing information leading to learning and

[49] Vine, "Francis Bacon, the Waste-Book, and the Ledger"; Dana Jalobeanu, *The Hunt of Pan: Francis Bacon's Art of Experimentation and the Invention of Science*, in preparation.

[50] Jalobeanu, *The Art of Experimental Natural History: Francis Bacon in Context*, Chapters 5-7.

[51] Seneca, Epistle 84, 5-7, in *Epistles* 66-92, vol. V, *Loeb Classical Library*, translated by Richard M. Gummere, Cambridge, Mass.: Harvard University Press, 2001.

discovery. His dynamic archives of natural (and experimental) histories were organized with the intended purpose of facilitating and triggering invention. Similarly, for some of the Baconian virtuosi, gathering and managing information meant more than stockpiling notes. It meant a collaborative, research-oriented investigation, directed by clear-cut questions (topics of inquiry) and leading, eventually, to the discoveries of the new science.

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BOOK REVIEWS

Jakó Zsigmond (ed.), *Köleséri Sámuel tudományos levelezése 1709-1732*, Kolozsvár: Erdélyi Múzeum Egyesület, 2012, 256 pp.

How many people know that a little-known Transylvanian doctor was a member of the Royal Society? Most Anglophone scholars are, by and large, familiar with the history of Transylvania when it was a relatively self-governing Principality. This is because, perhaps, it is during this period that Transylvania makes 'most sense' as an offshoot of the confessional struggles of the Reformation. Hence the industry of German nineteenth-century scholarship on the Siebenburgen. The area was, courtesy to the international dimensions of Calvinism, far from isolated from intellectual currents elsewhere in Europe beyond the Reformation. The currents of thought, however, of the early enlightenment are rather less well-studied, and this is partly because the overall historical context fits less readily into the paradigms of Reformation history. The later into the 'enlightenment' one goes, the harder it is to avoid the Romanian and Orthodox strands of thought (and then one is pestered by such pesky things as Romanian, Greek, Cyrillic scripts and the Phanariots). Yet often Transylvania has seen itself, fleeting, frail and fugitive state that it has been, as existing in a rather marginal fashion to the cultural and intellectual centres. This generated a set of fascinating approaches to the career. After all, with no full-scale universities in Transylvania, the early modern intellectual had to forge career paths either in foreign universities or pursue the life of the mind alongside different ways of life in his homeland. Thanks to this excellent monument to the scholarship of the recently deceased Zsigmond Jakó, we see the world of one Transylvanian intellectual through the prism of his correspondence in the early years of the eighteenth century.

The correspondence is said to be 'tudományos,' and certainly the student of Central Europe has his appetite whetted to learn much more about Köleséri's (1663-1732) intellectual life. What is known about him may be summed up fairly quickly. Born into a Hungarian Reformed family, he studied philosophy and theology in England and the Netherlands, becoming a doctor of the poor and a secretary of a local mining industry organization (Transylvania having long been famed for its rich mining deposit). He returned to Sibiu, and set up medical practice. We learn from one letter (p. 24) of the troubles he had setting up his 'apothecaria.' His most famous work was a kind of weird combination of his polyhistor interests with his local scientific ones: the work was on the mines of ancient Dacia, but he remained above all a doctor. There is a long letter here on the plague that started in 1718 (pp. 31-37), where we learn of a six-week quarantine seclusion, after the authorities had put up notice boards showing a hundred thousand dead. Fans of Transylvanian vampirology will be delighted to learn that in the fearful atmosphere of plague a suspiciously undecomposed dead body was dug up and burned to ward off the disease (p. 35). The remedy did not prove effective.

Indeed, the importance attached to weather, and the ability of Köleséri to note it down is one of the most interesting aspects of this correspondence, for he was an observer, affected by the observation mania of his day: "*die 23 Decembris*

hora noctis tertia apparuit phaenomenon arcuatum a plaga australi surgens versus borealem, cum rubedine, sed illuminata stellis per eandem transparentibus, qui nocturnis incendiis coelum obduci, solemne est, sensum protensum, donec arcui albo caerulei coloris ex borea surgenti occurreret, simulque aurora imminente ambo evanescerent." This kind (p. 36) of 'rhetoric' would have been less precise a hundred years earlier. In general, the work is full of interesting sidelights onto the intellectual culture of the times, including a letter (p. 43) to Jakob Scheuzcher, the Hungarian translator of, amongst other works, the English scientist John Woodward's *Idea of Human and Natural Structure.* It is clear that the translation programme of Scheuzcher was in part influenced by the great plague of 1718-1719, since we learn he also translated a work on an outbreak of the plague in France. Another interesting French connection was Philip Hecquet, whose commentary on Hippocrates's aphorisms (1724) was devoured by our correspondent. And as a practicing doctor, without the resources to perform complicated medical experiments, Köleséri may have found the format of Hecquet's work (which he calls a "vadimonium," p. 142) to be readily digestible for the *ars*, not *scientia*, of healing.

There is a full bibliography, which should function as a general introduction to the early enlightenment in Transylvania. The introduction is shorter than one would wish, and some more setting in context (as I have attempted to do in this little review) would have been welcome. I did not always agree on the Latinity of every phrase: for example "*quasi steriitatem lugentis duplici anni agricolis mercede compensare conaretur anni ubertas*" sounds as though it ought to read "*lugentibus*" in apposition with the farmers. But it may be that this is what the correspondent originally wrote, whether or not it makes sense. In general, a slightly higher level of linguistic commentary would have been appreciated by the present reviewer (n.b. singular "*frustravit*" with plural subject at p. 33). But that is a minor carp, and this will be a very useful resource for all those interested in the intellectual history of Central Europe. Libraries should buy it. And at 20 lei, it's a snip.

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Justin E. H. Smith, *Divine Machines: Leibniz and the Sciences of Life*, Princeton, NJ: Princeton University Press, 2011, 392 pp.

In this monograph Justin E.H. Smith offers an important new interpretation of Leibniz, the main originality of which is its argument that the life sciences were as central to Leibniz's thought as logic, mathematics, metaphysics or physics were. This interpretation fits into a recent trend in Leibnizian scholarship led by researchers such as Daniel Garber, Catherine Wilson and, probably closest to the spirit of the present work, François Duchesneau, who emphasize the

natural-philosophical side of Leibniz's thought as opposed to the general picture of Leibniz as an idealist far removed from the natural world. Here, it is particularly the 'life science' aspect which is promoted to centre stage. This does not mean, however, that it is biology *rather than* logic, mathematics, metaphysics or physics that forms the core inspiration of Leibniz's philosophy, but rather that it plays an important structuring role in the latter—originally due, Smith argues convincingly, to Leibniz's interest in the reform of the practice and institute of medicine in Germany (chapter 1 and pp. 65f., 81f.; some of these Leibnizian texts on medicine are translated and included as appendixes here).

On a more general level, the book offers us a more nuanced understanding of the Scientific Revolution, which has traditionally been associated with developments in mathematics and the pure parts of physics. In the past two decades, this picture has been greatly altered by studies of the major role played by the life sciences in the philosophical systems most closely associated with the new science (including volumes edited or co-edited by Smith himself). In line with such studies, Smith sketches a picture of Leibniz as sensitive to developments in geology, chemistry and biology (as we would call them today). In reading Leibniz mainly through his logic, mathematics and physics, we may have been overlooking precisely the role that the life sciences, and the broader body of disciplines to which they belonged (along with chemistry and mineralogy), have played in the so-called Scientific Revolution. This is perhaps most apparent from Smith's discussion of Leibniz's eventual predilection for "microbiology," which reveals the massive impact of the microscope in the scientific landscape of the latter half of the seventeenth century: "If Aristotle's was a biological metaphysics, Leibniz's was thoroughly *micro*biological" (p. 97). Not only did the microscope teach us that the universe is teeming with life beyond the borders of the visible by revealing the existence of, amongst others, 'spermatic animals' in rapid and lively motion, but it also provided a paradigm for diligent empiricism in the life sciences. Even if Smith may perhaps end up overestimating the importance of the work of early microscopists such as Swammerdam, Malpighi or Leeuwenhoek for Leibniz's metaphysics, he does present a compelling account of how the empiricism of life scientists could inform even the seemingly most aloof systems of thought produced by early modern philosophy—in a phrase (one example among several), how nutrition was in fact "a metaphysical problem," however odd this might seem: "within the framework of a corporeal-substance metaphysics, one cannot avoid the question as to precisely how what was previously external to and nonidentical with the corporeal substance becomes incorporated into it, and is thereby literally substantially transformed" (p. 74). This presence of 'the medical' at the heart of the most abstruse metaphysics should not be confused with what is in a way its mirror image, the increasingly materialist appropriation of the monad, as Canguilhem first put it, notably in the case of Maupertuis' 'molecules' (discussed p. 185).

An important thesis defended by Smith is that Leibniz's sensitivity to developments in the life sciences influenced his idea of a body. This would suggest

that Leibniz had living systems in mind as the paradigm of a body, rather than as a disconcerting exception to the otherwise highly intelligible physical bodies, or, on the idealist reading, mere epiphenomena of underlying real substances. Smith suggests a link between the alleged evolution in Leibniz's metaphysical notion of a substance and his shift from an interest in the vivisection of macroscopic animals (p. 52) to a fascination with the observation of microscopic animals. These shifts are also marked by a change in Leibniz's conception of an organism, from a "hydraulico-pneumatico-pyrotechnical machine" to a "machine within machines to infinity" (p. 98 and *passim*).

Smith argues that, although Leibniz is amongst the first to coin the idea of organism (pp. 102, 105f.) and in fact contrasts it with mechanism, he does not regard the two terms as *antonyms* (pp. 107-108). In fact, organism, for Leibniz, is an extremely (maybe even infinitely) intricate mechanism. On this reading, 'organism' is not a term that refers first and foremost to an individual (this or that organism), but is a general term used to denote a kind of structure. Similarly, Smith points out that an organic body, for Leibniz, is not itself a complete substance, but rather the corporeal part that constitutes a complete substance only when joined with a substantial form: "Corporeal substances are, then, different from organic bodies, to the extent that they consist in bodies together with substantial forms or dominant monads" (p. 113). From this Smith goes on to explicate Leibniz's idea of organisms as being 'nested mechanisms', i.e., machines that can be infinitely decomposed into parts that are themselves machines, and not just simple parts. This is not the case for man-made machines, the parts of which are seldom mechanisms themselves, and never decomposable into mechanisms *ad infinitum*. Secondly, an organism is a machine that is capable not only of highly complex movement, but is more importantly a quasi-perpetual motion machine, which means that it is capable of fetching its own fuel (p. 249). Again, this is an important difference with man-made machines, which are dependent on people supplying them with new fuel in order to continue moving. Organisms are, then, qualitatively machines, but their level of intricacy is infinitely above the artifice of man—they are, as the title of the book indicates, *divine machines*. Thus Leibniz gives a highly intriguing answer to the problem of biological individuality by maintaining that the unity of a biological individual is not threatened by its containing other biological individuals (p. 138; something we hear about today from philosophers of biology focusing on bacteria and our immune system, like Thomas Pradeu). Yet of course we are not in the fully chaotic, modern-Epicurean world of a Diderot: as Leibniz wrote to Sophie Charlotte in 1696, "My fundamental meditations revolve around two things, to know unity and to know infinity. Souls are unities and bodies are multitudes" (cit. p. 110).

The idea that organisms are divine machines leads Leibniz to dismiss claims that such machines can come into existence in nature. Smith discusses the consequences of this belief for Leibniz' embryological position (in chapter 5) and three other forms of natural generation, namely the influence of maternal imagination on the unborn child, spontaneous generation and the origin of paleontological forms,

i.e., fossils (chapter 6). With respect to the topic of generation, Smith argues that Leibniz was led to a theory of divine preformation by his conception of an organism—namely the theory that no new organisms ever come into existence or fade into non-existence, aside from divine creation or annihilation, and that what we take to be generation is really growth and transformation. He was reinforced in these ideas by the findings of Leeuwenhoek, who communicated his discovery of animalcules in male semen to the Royal Society and whom Leibniz met during his visit to the Netherlands during which he also met Spinoza; and Swammerdam, who described how a butterfly is already to be found in the cocoon, although enveloped, and that a process of transformation—development—was required to make it into a full-fledged butterfly. Leibniz's belief that an organism is infinitely complex, and therefore only formable through an infinite amount of steps, leads him to deny spontaneity to nature in the sense that it can of itself generate (p. 195). Chapter 6 traces how this commitment influences Leibniz's thought on the possibility of the mother passing on traits to her unborn child through the workings of imagination, the impossibility of spontaneous generation, and the impossibility of fossils being the result of mere "games of nature." For Smith, these theories show Leibniz's unswerving commitment to explaining away the alleged occurrence of spontaneity in nature. In fact, he goes on to suggest that there is a striking analogy between the prevalent early modern theories of generation and of causation considered by Leibniz. Thus there seems to be a parallel between epigenesis and Cartesian interactionism, between spontaneous generation and occasionalism, and finally between preformation and preestablished harmony (pp. 193-194).[1] This analogy suggests that we need to revisit our picture of causation as it appeared in early modern philosophy from a perspective that is more informed by the life sciences.

Smith closes his book with a study of Leibniz's position on the species problem—the topic of his forthcoming monograph. He argues that Leibniz in fact did believe in the existence of real, distinct species that are defined by shared genealogy, i.e., inclusion in the species through parental lineage (pp. 270-271). This is interesting because it allows him to state that there may be variations within a species, and even some transformation over time, but that this does not disprove the existence of species. Because of the implications drawn later from such a view, Smith is quick to note that Leibniz would equally think it precludes speciation. Also, it reveals Leibniz' commitment to monogenesis, namely the idea that all human beings descend from the same ancestors. Smith notes in this context that monogenesis may have mitigated racism for a while, since it bars you from seeing the differences between human 'races' as evidence of the inhumanity of one of these 'races' (cf. p. 273).

In conclusion, this book is not only a valuable contribution to Leibniz scholarship, but also a courageous attempt to indicate the great extent to which

[1] Smith refers approvingly to Karen Detlefsen, "Supernaturalism, Occasionalism, and Preformation in Malebranche," *Perspectives on Science* 11.4 (2003), pp. 443-483.

the life sciences have molded the new science of the seventeenth century (and by extension some of its metaphysics), and remediate the distorted picture of a physics-centered science that still teems amongst philosophers and scientists alike. Smith's Leibniz bears testimony to the intricate connectedness of the various, multifarious scientific disciplines, and the fruitful nature of this interconnectedness in the history of thought.

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Élodie Cassan (ed.), *Bacon et Descartes. Genèses de la modernité philosophique*, Lyon: ENS Éditions, 2014, 195 pp.

The aim of this collection of essays is, as Cassan emphasises in the introductory study, "D'un usage herméneutique du couple Bacon Descartes pour l'histoire de la philosophie moderne," to recreate the intellectual web which connects the two thinkers and to examine the ways in which their philosophical conceptions converge, differ and oppose each other (p. 14). Because in the second half of the seventeenth century it was commonplace to read Bacon and Descartes together, the first objective of this volume is to answer the question "How was this possible?" As a consequence, the book is centred on Bacon's reception in France in the first half of the seventeenth century. In this way, the very relationship between empiricism and rationalism is brought into discussion and analysed through various aspects of Bacon's philosophy. The book is structured in two parts. The first answers the question whether Bacon and Descartes are two rival figures and the second analyses the diffusion of Bacon's thought in post-Cartesian France.

The first article, by Marta Fattori, analyses the "Relation between Bacon and the French culture between 1576 and 1525." Bacon's travel to France as a child, Fattori claims, will always have echoes in his life, through the spirit of the French anecdotes and the Parisian meetings, and even more than this, through the French philosophical and cultural life, as pictured in the French "salons," the ideal place to criticize Aristotle (p. 29). Moreover, Fattori argues that Bacon had been in constant contact with the French culture, citing on several occasion authors such as Du Bartas, Rabelais and Montaigne, and it is clear that he knew the works of Charron and Philippe de Commynes. Bacon's works circulated in France (in published or in manuscript form) since very early on and they caught the interest of Gassendi, Peiresc, La Mothe Le Vayer, Naudé, Saint-Évremond,

Mersenne and Descartes. Focusing on the connection with Descartes, Fattori concludes that what unites the two philosophers, in a conscious or unconscious way, are the criticism of Aristotle, the elimination of final causes and of syllogisms, and the *expurgatio* of all previous doctrines.

Jean-Pascal Anfray authors the second essay, "Les Géorgiques de l'esprit: pouvoir de la rhétorique et faiblesse de la volonté selon Bacon." According to the author, Bacon's project of the *Instauratio magna* has a strong ethical aspect, with two main elements: the superiority of the *vita activa* to the *vita contemplativa* and of the *bonum communionis* over the *bonum individuale*. In short, Bacon's project has an intrinsic moral value as its basis is charity, considered the cardinal virtue. The article aims at answering two questions: why is the Georgics of the Mind indispensable for Bacon and what is the role of rhetoric? The answer to the first question resides in the impossibility of reason to cure itself and thus the need to receive help from outside. In this way, reason needs imagination to subdue the passions and this can only be done with the persuasive force of rhetoric, which answers the second question.

In the third paper Philippe Boulier discusses the "Conception mathématique de la nature et qualités sensibles chez Bacon et Descartes." The starting point is the interpretation proposed by André Lalande, according to which on the one hand Bacon explains the qualities in terms of corpuscular structures and on the other the congregations of qualities and actions are ruled by laws, which means that nature is governed by necessity. After analysing the two approaches leading to the definitions of colours, from the *Valerius terminus* and the *Regulae*, Boulier concludes that the two metaphysical explanations of qualities in Bacon and Descartes are in fact not similar. It is true, he continues, that one can find in Bacon a fundamental uniformity of nature, a distinction between essential qualities and those relative to human perceptions, that the mathematical forms are the essential forms of reality and that in the case of colours he uses the example of geometrical figures, but these characteristics do not lead to the conclusion that the language of nature is geometrical. Bacon's physics remains, nevertheless, Boulier concludes, qualitative (p. 84).

Chantal Jaquet's article "De l'historire naturelle à la *mathesis universalis*: «Le grand appendice de la philosophie naturelle» chez Bacon" begins by questioning the idea that Cartesian and Baconian physics are very distinct. The author claims that Bacon's change of the status of mathematics, from a branch of metaphysics in the early writings to an appendix of natural philosophy in the latest, is what connects Bacon's method with the one followed by Descartes in elaborating a *mathesis universalis*. This change is twofold, in place and in rank. Mathematics is no longer studied after, but before, operative natural philosophy. Becoming an appendix means that mathematics achieves a transcendental value: it becomes more important for speculative philosophy and an instrument of the operative one. Jaquet advances the hypothesis that what makes Bacon change the status of mathematics is his criterion of practical usefulness, influenced by the success of mathematics in other practical sciences. In its role of ordering and measuring,

Baconian mathematics comes closer to Descartes' *mathesis universalis* (p. 95). There remains, however, an essential difference between Bacon and Descartes: for the former mathematics is dependent on the other sciences, for the latter the other sciences are dependent on mathematics.

"The Place of the Imagination in Bacon's and Descartes' Philosophical Systems" is the title of the fifth article, written by Guido Giglioni. The article states that the two different approaches to imagination, the ability to feign for Bacon and the capacity to form things for Descartes, reveal fundamental differences in their philosophical systems. In Descartes' philosophy, the trained mind of the philosopher can produce an intelligible matter, devoid of all sensible forms and this indicates the highest level of intelligibility compatible with the study of nature. By contrast, for Bacon matter represents a substratum with several desires and, imagination is corrupted by the very same passions. These different conceptions lead to distinctive medicines of the mind: Bacon requires that in natural philosophy one should not imagine more than is found in reality, for Descartes it is what one imagines reality to be that makes him understand that for us things are the way we think of them, even if they are not like that in reality. Giglioni concludes that for Bacon imagination needs to be restrained and controlled, while for Descartes it can be trusted to fly over the territories of the intellect.

The last article in this part is "Mersenne et la philosophie baconienne en France à l'époque de Descartes" by Claudio Buccolini. The author offers a survey of the way in which Mersenne and some other prominent figures in French philosophy in the seventeenth century read and interpreted Bacon's philosophy. For Mersenne, Bacon is at the beginning one of the *novatores* inspired by heretical doctrines and his method is a mere appeal to experience, similar to the one preferred by the atheists. Though later he still compares Bacon with the Sceptics, Mersenne agrees that his method is the "truth of sciences." However, Mersenne's interest in Bacon grows under the influence of Cornier and the members of the Rouen Circle on the one hand (Descartes, Gassendi and La Mothe Le Vayer) and of the Dupuy Circle on the other (p. 124). In this way, he translates and uses Bacon's experiments on sounds, cites in his works and correspondence other experiments from the *Sylva sylvarum*, the *Novum organum*, and the *Historia ventorum*, and mentions the *New Atlantis*.

The second part of this collection of essays, "La diffusion de la pensée baconienne dans la France post-cartésienne" starts with Dana Jalobeanu's article "The French reception of Francis Bacon's natural history in mid seventeenth century." It focuses on the first translation of *Sylva sylvarum* in French, edited by Pierre Amboise, and published in 1631. The book is organized differently, heavily edited, and has many things left out, Jalobeanu's conclusion being that it seems to be written by someone who did not understand Bacon's *Sylva* (p. 146). More interestingly, the editor seems to have a special interest in alchemy and matter theory, modifying Bacon's text according to his ideas. There is a big number of textual additions and these change not only the emphasis, but also the meaning of Bacon's text. In the same way, Amboise eliminates the advice to

further development and eliminates or transforms the hypotheses into positive claims, both of these being significant features of Bacon's natural histories. This inclination to modify Bacon's natural histories, though not as heavily as in this case, is, according to Jalobeanu, a common feature of Bacon's translations into French in the seventeenth century.

The article by Carlo Carabba, "La première traduction du *Novum organum*," analyses another translation of Bacon's writings into French, this time left in manuscript. The manuscript, by an anonymous translator, contains the preliminary writings to the *Novum organum*, the first hundred aphorisms of the first book and the first eleven of the second. The translation reveals a double prudence, Carabba claims, religious and political (p. 169). From a lexical point of view, the translation is free and not always coherent, though the translator is more careful with specific Baconian terms, which reveals that he is knowledgeable of both the tradition of natural philosophy and of Bacon's writings in general, even those still existing in manuscript at the time. The author considers that the translation reveals an obvious philosophical project: the polemics with the ancients are more detailed; there are indications that he sees the senses as the unique source of knowledge; and there is a frequent addition of the term "claire," which reveals his knowledge of the Cartesian corpus.

Ronan de Calan's study "Comment un cartésien peut-il devenir baconien?" closes the volume. The answer to the title-question is given from the beginning: "In the philosophy of the French Enlightenment." The article starts with the analysis of the entry on Baconianism from the *Encyclopaedia* written by the abbot Prestré, which corrects Descartes' philosophy through Bacon's and can be considered as exposing the art of becoming Baconian when one has been a Cartesian (pp. 177-178). What the article argues for is the idea that the philosophers of the Enlightenment covered under Bacon's tutelary figure their opposition to Descartes' philosophy, though it is obvious that they were not careful readers of Bacon's works, but wished to support Newtonian and Lockean ideas, and Baconianism could help them with that. The only exception, de Calan adds, was Diderot, who knew Bacon's writings very well and developed a theory of experimentation based on Bacon's idea of the degrees of certitude found in the *Novum organum*.

In conclusion, the volume represents a very valuable contribution to the history of early modern philosophy and science, by bringing together two of the most significant figures of the period, Francis Bacon and René Descartes, and by studying the reception of Bacon's ideas in France in the seventeenth and eighteenth centuries. This collection of articles questions both what has been considered to be different and what has been considered to be similar in the two approaches and enriches our perception of the distinction between empiricism and rationalism, as found in the philosophies of Bacon and Descartes.

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Marco Sgarbi, *The Italian Mind. Vernacular Logic in Renaissance Italy (1540-1551)*, Leiden, Boston: Brill, 2014, 246 pp.

Does the language in which a philosophical text is written matter? Today, the academic world is becoming more and more Anglophone. Nonetheless, we would probably answer this question in the negative. No, the language in which philosophy is written does not matter. After all, we use English instead of other languages only because we think that English provides a more successful medium to spread ideas and information among the greatest number of people. Arguably, in the future we might shift to Spanish, Chinese or Latin. The assumption behind this attitude is that what really matters in philosophy is philosophy itself, not the language in which it is expressed. We could say, what matters is the *res*, not the *verba*. Insofar as we follow this line of reasoning, we are still carrying on the legacy of something that happened in the sixteenth century. Marco Sgarbi's new book, *The Italian Mind*, investigates this event.

Sgarbi reconstructs with admirable erudition the cultural project developed by philosophers linked to the Accademia degli Infiammati (Padova, 1540-1551), who theorized and produced the first logic written and published in vernacular language (*volgare*). In his introduction, Sgarbi explains that humanist logic was deeply committed to the inseparability between knowledge and its linguistic expression. *Res* and *verba* were conceived of as intimately connected. On the contrary, "logic in the Cinquecento completely separates *res* and *verba*, eloquence and wisdom, rhetoric and dialectic. Moreover, the point of reference will no longer be models of classical oratory, but the finest of the Greek interpreters or Aristotelian logic to be discovered around the turn of the century" (p. 9). According to Sgarbi, this change of perspective allowed logic to be conceived more as an *instrument* helpful for developing other disciplines, natural philosophy *in primis*. The book reconstructs the main steps in which this project was articulated by different intellectuals and philosophers linked with the Academia degli Infiammati.

Chapter Two reconstructs the immediate background necessary to understand the cultural program pursued by the Academia. Sgarbi focuses in particular on Pomponazzi and his anthropology as the theoretical starting point of subsequent developments. As Sgarbi puts it, "Pomponazzi's legacy hinges primarily on two conceptual nuclei concerning the anthropological question and the philosophy of history, both firmly rooted in a strictly naturalist and fatalist context. Alongside these two thematic cores, scattered references to the philosophy of language testify to his influence on the first generation of the infiammati" (p. 33). Pomponazzi's anthropology deals with the thorny question of human *mortality.* In Pomponazzi's view, practical reason has a central role in defining the human being as a *citizen* (*cives*) and thus in grounding its

political activity. In Sgarbi's reading, the Infiammati developed this idea by combining it with a Stoic and necessitarian view of history as strictly determined by fate. As Sgarbi explains: "Following the theories of Pomponazzi and transposing them to the context of linguistic theories, it no longer makes sense to speak of the expressive power, eloquence and rhetoric of the Latin language, nor for that matter of fourteenth-century Italian. Each era is characterized by its own language and the language of the Cinquecento is sixteenth-century *volgare*: this Pomponazzian perspective gives the Infiammati the theoretical legitimacy to treat every topic in the vernacular" (p. 39).

Chapter Three focuses on the first philosopher actually involved in the Academia degli Infiammati, Sperone Speroni (1500-1588). Speroni is the first bold advocate of an instrumental conception of logic, which allows its expression in vernacular language. According to Sgarbi, "Speroni's programmatic ideas correspond to a conception of logic, whose goal was no longer to persuade through style, language and dialectical arguments, but to verify the formal correctness of arguments and concepts which could be expressed in any language" (p. 62). While Speroni established the programmatic framework to conceive of a vernacular logic, Benedetto Varchi (1503-1565) was the first who concretely worked toward its realization. In Chapter Four, Sgarbi examines in detail the philosophical relevance of Varchi's monumental *Commento* on Aristotle, the first that was written in Italian: "Varchi's approach to logic is not original solely because he developed his ideas in the vernacular language, in itself a highly significant achievement, but also because his ideas at that time were pioneering. In particular, the idea that logic is an instrument for the other sciences and method is an instrumental habit mark the very first reception of Alexander of Aphrodisias, whose influence would spread throughout the sixteenth century, in both the vernacular and Latin, among logicians and philosophers. It may be asserted with certainty that it was Varchi in Padua, in the context of the Accademia degli Infiammati, who gave a decisive impulse in this direction, a direction which was undertaken because logic was seen as a means to help even those who are not versed in Latin to reason correctly, to distinguish truth from falsehood and to judge good and bad" (p. 120).

In this intellectual *milieu* Antonio Tridapale published the first vernacular logic in 1547. In Chapter Five, Sgarbi shows how Tridapale followed the idea already put forward by Speroni and Varchi that logic must serve as an *instrument* to understand and deal with other disciplines. Nonetheless, in Tridapale's work another crucial aspect of the *political* project connected to vernacular logic also emerges in a forceful way: "knowledge must be structured scientifically upon principles which only logic can establish, and for this reason logic must be made accessible to all, because a greater number of people can gain knowledge and there can be a greater number of new discoveries: a genuine democratization of knowledge geared to progress" (p. 153).

Two years after Tridapale's logic, Nicolò Massa (1489-1569) also published a vernacular logic. In Chapter Six, Sgarbi remarks that although Massa's is less committed than Tridapale's to the use of the vernacular, he nonetheless introduces an important nuance in the general project carried out by the Infiammati. Indeed, the more logic is freed from the humanist account the more it can be used as an instrument to deal with other disciplines. This is the case of Massa's work that shows how logic can (and should) be first of all employed toward the advancement of scientific knowledge and natural philosophy. Such a tendency emerges even more sharply in Alessandro Piccolomini (1508-1578). In Chapter Seven, Sgarbi reconstructs the complex cultural project elaborated by Piccolomini. Logic appears as the key to successfully work out all the other disciplines and, for this reason, vernacular logic is particularly important. Indeed, only in this way a complete system of knowledge can be not only established but also communicated to a broader audience. Thus, Piccolomini combines the two crucial instances of the cultural project of the Infiammati, namely, the *instrumental* character of logic and the democratization of knowledge pursued through the use of vernacular language. As Sgarbi states, "[l]ogic thus represents for Piccolomini the cardinal element on which the entire edifice of knowledge, both theoretical and practical, is constructed. Piccolomini's predilection for natural philosophy is evident, and so too logic is instrumental in the acquisition of all new knowledge, something which, because it should be accessible to every human being, must be presented in the vernacular" (p. 212).

In his concluding chapter, Sgarbi pinpoints two main reasons that made possible the development of vernacular logic in the Italian Cinquecento. The first is sociological and it is connected "with the rise of the book as the new and primary means of disseminating knowledge" (p. 213). This entails a deep transformation in the society and culture of the period, which progressively passed from a court-based model to a more dynamic environment, based upon universities (e.g., Padua) and broader intellectual exchanges of ideas (through books). The second reason is theoretical and lies in the dismissal of the humanist link between *res* and *verba*.

Sgarbi also draws attention to two major outcomes of his reconstruction. The first concerns the "democratization" of knowledge. As Sgarbi writes, "a new conception was fast gaining currency according to which knowledge was above all else equated with power. There would seem to be nothing surprising in such an 'innocent'-seeming idea, yet when coupled with the idea that knowledge is not only power, but power that must be available to all—as we saw in Tridapale—it is easy to see how radical a shift it was compared to a past in which knowledge was the exclusive domain of the universities and the clergy. […] This idea constitutes a genuine impulse towards the democratization

of knowledge generated by a new culture; a new Renaissance *Gestalt*, which differs from the culture of the Quattrocento, and which appears to anticipate the Baconian perspective: *Multi pertransibunt et augebitur scientia*!" (p. 215).

The second outcome concerns the assessment of the impact that the project of a vernacular logic had on the Italian culture of the mid-sixteenth century. Here, Sgarbi is more cautious in his conclusion: "I believe it is worth asking what impact this vernacular logic had. Unfortunately there is no significant evidence, and at first blush there would seem to be no influence whatsoever. The most important logical treatises in Latin in the Cinquecento, such as Zabarella's, for example, appear to make no mention of the vernacular logics. The reason is no doubt to be sought in the fact that the model of exposition of vernacular logics differs greatly from that of the Latin logics, which are far more detailed and caviling. It is highly implausible, however, that the world of Latin logics remained completely detached from that of the Italian vernacular logics" (p. 218).

These two points—democratization *and* apparently weak influence—call for some further reflection. Arguably, Sgarbi's use of the term "democratization" should not suggest a properly *political* agenda. After all, the free and flourishing Venetian Republic was far from a democracy and was not transformed into a more democratic regime by vernacular logic. What the term does capture, instead, is the idea that by making knowledge—and the instrument to acquire further knowledge, i.e., logic—accessible to a broader audience inevitably involves in the cultural arena subjects who were previously excluded, such as women. For instance, Sgarbi rightly emphasizes that "women had come to represent a new readership for works in the vernacular, and Piccolomini, from his very first literary experiments, was particularly sensitive to them" (p. 188). One can only hope for further research on this topic. The project of vernacular logic might be indeed reconsidered as a remedy *avant la lettre* for gender issues. From this point of view, it could be asked to what extent a "linguistic politics" such as that proposed by the Infiammati could involve women (for instance) in debates from which they would have been otherwise excluded. From this point of view, it is possible to appreciate a *qualitative*—if not *quantitative*—political meaning to the "democratization" pursued by vernacular logic.

Sgarbi's conclusions raise questions concerning the influence and reception of this project. Sgarbi notes that "perhaps the most important place in which it is possible to see points of contact and a possible influence of vernacular logic on Latin logic is the conception of logic as an instrument of scientific research. The influence of vernacular logic on Latin logic would appear all the more apparent when considered in relation to Zabarella, who not only knew many members of the Accademia degli Infiammati, but upon whose ashes he

founded the Accademia degli Stabili, which had the same aims" (p. 218). This sounds like a promising working hypotheses deserving further inquiries and should encourage scholars in renaissance and early modern studies to add a new line of inquiry to their agendas.

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Books Received

Roger Ariew, *Descartes and the First Cartesians*, Oxford: Oxford University Press, 2014, xix + 236 pp.

Marisa R. Cull, *Shakespeare's Princess of Wales. English Identity and the Welsh Connection*, Oxford: Oxford University Press, 2014, 203 pp.

Axel Erdmann, Alberto Govi and Fabrizio Govi, *Ars Epistolica. Communication in Sixteenth-Century Western Europe: Epistolaries, Letter-Writing Manuals and Model Letter Books 1501-1600*, with an Introduction by Judith Rice Henderson, Luzern: Gilhofer and Ranschburg, 2014, xxvi + 771 pp.

Joe Moshenska, *Feeling Pleasures: The Sense of Touch in Renaissance England*, Oxford: Oxford University Press, 2014, 389 pp.

Scott Oldenburg, *Alien Albion: Literature and Immigration in Early Modern England*, Toronto, Buffalo, London: University of Toronto Press, 2014, 290 pp.

Daniel Starza Smith, *John Donne and the Conway Papers. Patronage and Manuscript Circulation in the Early Seventeenth Century*, Oxford: Oxford University Press, 2014, 390 pp.

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• Please use footnotes, not endnotes. Footnotes should be brief and include only what is necessary to document an argument. They should be numbered consecutively throughout the paper. Please place footnote numbers after punctuation marks like comma or period, but before semicolons.

• Quotations should be set in double quotes. The quotation marks in English are as follows: "quote" (simple) and "[...] '[...]' [...]" (double). In French: « citation » (simple) and « [...] "[...]" [...] » (double). Long quotations (more than 3 lines) should not be enclosed within quotations marks, but should be indented (left-indent 1 cm, right-indent 1 cm) and separated from the preceding and following lines of typescript by one space before, one space after.

• Em-dash and En-dash. The Em-dash (—) is used in English without spaces around it, in order to demarcate a break of thought or some similar interpolation stronger than the interpolation demarcated by parentheses (e.g., "Tradition, in this second sense, is something that survives—survives the time in which it was instituted—and something that survives is in the process of survival"). The En-dash (–) is used in English without spaces around it, in order to indicate ranges of time (1977–2001), page numbers (pp. 56–64), or other compound forms, such as "love–hate relationship." In French, in order to demarcate a break of thought or some similar interpolation stronger than the interpolation demarcated by parentheses, one uses the En-dash (–) with spaces around it (body text – interpolation – body text).

• In order to mark multiple page numbers, the correct form in English is pp. 56–64, in French p. 56–64. Inclusive page numbers and dates should be typed according to the following examples: 3–17, 23–26, 100–103, 104–107, 1002–1006, 1115–1120, 1496–1504.

• The author's own translations of foreign-language passages running to more than a few words should be accompanied by a footnote providing the original text.

• Greek texts should be left in the original and will be printed in Greek characters. If possible, use Kadmos as your font. In all other cases, Greek words should be transliterated into their Greek forms (e.g., *Nikonion*, not *Nicomium*). Latin and other foreign languages not requiring transcription should be italicized in the typescript.

• Works Cited: please include a separate bibliography at the end of the article. The authors should be listed in alphabetical order. Different publications by the same author should be listed chronologically.

• Footnotes: please use the complete reference for the first citation and short titles with page numbers for all subsequent citations. E.g.: First citation: Roger Ariew, "Descartes and Humanism: Historical Method, Anti-Syllogism, and (Neo) Stoic Ethics in the Discourse on Method," *Revue Roumaine de Philosophie* 54 (2010), pp. 163–174. Subsequent citations: Ariew, "Descartes and Humanism," p. 170, etc.

• Full bibliographical references should be given as follows:

English

a) Books:

Blaise Pascal, *Pensées*, ed. and trans. with introduction by Roger Ariew, Indianapolis, Cambridge: Hackett, 2005.

Daniel Garber, *Descartes Embodied: Reading Cartesian Philosophy through Cartesian Science*, Cambridge, New York: Cambridge University Press, 2001.

Theo Verbeek, Erik-Jan Bos and Jeroen van de Ven (eds.), *The Correspondence of René Descartes 1643*, with contributions of Henk Bos, Carla Rita

Palmerino and Corinna Vermeulen, Utrecht: Zeno Institute for Philosophy, series "Quaestiones infinitae" 45, 2003.

Sorana Corneanu, *Regimens of the Mind: Boyle, Locke, and the Early Modern* Cultura Animi *Tradition*, Chicago: University of Chicago Press, 2011.

Dimitrie Cantemir, *L'immagine irrafigurabile della Scienza Sacro-Santa*, a cura di Vlad Alexandrescu, traduzione di Igor Agostini e Vlad Alexandrescu, introduzione e note di Vlad Alexandrescu, edizione critica del testo latino di Dan Sluşanschi e Liviu Stroia, Firenze: Le Monnier Università, 2012.

b) Article published in an edited volume:

Stephen Gaukroger, "The Unity of Natural Philosophy and the End of Scientia," in Jill Kraye, John Rogers and Tom Sorell (eds.), *Scientia in Early Modern Philosophy: Seventeenth-Century Thinkers on Demonstrative Knowledge from First Principles*, New York: Springer, 2010, pp. 19–34.

Dana Jalobeanu, "Bacon's Brotherhood and its Classical Sources: Producing and Communicating Knowledge in the Project of Great Instauration," in Claus Zittel, Gisela Engel, Romano Nanni and Nicole C. Karafyllis (eds.), *Philosophies of Technology: Francis Bacon and his Contemporaries*, 2 vols., Leiden: Brill, series "Intersections" 11, 2008, vol. 1, pp. 197–231.

Justin E.H. Smith and Pauline Phemister, "Leibniz and the Cambridge Platonists in the Debate over Plastic Natures," in Pauline Phemister and Stuart Brown (eds.), *Leibniz and the English-Speaking World*, Dordrecht: Springer, 2007, pp. 95–110.

c) Article published in a journal:

Roger Ariew, "Descartes and Humanism: Historical Method, Anti-Syllogism, and (Neo) Stoic Ethics in the Discourse on Method," *Revue Roumaine de Philosophie* 54 (2010), pp. 163–174.

Christoph Lüthy, "Seeds Sprouting Everywhere," *Annals of Science* 64 (2007), pp. 411–420.

Koen Vermeir, "Vampirisme, corps mastiquants et la force de l'imagination: Analyse des premiers traités sur les vampires (1659-1755)," *Camenae* 8 (2010), on-line article [accessed 23 July 2012], http://www.paris-sorbonne.fr/IMG/pdf/6-_Vermeir.pdf.

Français

Les références aux textes écrits dans d'autres langues reprennent les normes françaises.

a) Ouvrage d'auteur :

René Descartes, *Oeuvres de Descartes*, éd. Charles Adam et Paul Tannery, 2e éd., 11 vols., Paris, Vrin, 1964-1974.

Vincent Carraud, Causa sive ratio. *La raison de la cause, de Suarez à Leibniz*, Paris, Presses Universitaires de France, coll. « Épiméthée », 2002.

Vlad Alexandrescu, *Croisées de la Modernité, Hypostases de l'esprit et de l'individu au XVII^e siècle*, Bucarest, Zeta Books, coll. « Foundations of Modern Thought », 2012.

b) Article dans un ouvrage édité :

Jean-Robert Armogathe, « Une ancienne querelle », dans Marc Fumaroli (éd.), *La Querelle des Anciens et des Modernes*, Paris, Gallimard, coll. « Folio », 2001, p. 799–849.

Eric Schliesser, «Without God: Gravity as a Relational Quality of Matter in Newton's Treatise », in Peter R. Anstey, Dana Jalobeanu (éds.), *Vanishing Matter and the Laws of Motion: Descartes and Beyond*, New York, Routledge, 2011, p. 80–102.

c) Article publié dans une revue :

Igor Agostini, « La démonstration de l'infinité de Dieu et le principe de la limitation de l'acte par la puissance chez Thomas d'Aquin. Notes sur l'histoire de l'interprétation de la *quaestio vii* de la *Summa Theologiae* », *Les Etudes philosophiques* 91 (2009), p. 455–476.

Stefano di Bella, « Leibniz's Theory of Conditions », *The Leibniz Review* 15 (2005), p. 67–93.

CONTENTS

Volume 1, Issue 1

ARTICLES

REVIEW ARTICLE

BOOK REVIEWS

Volume 2, Issue 1

ARTICLES

BOOK REVIEWS

Volume 2, Issue 2

ARTICLES

REVIEW ARTICLE

BOOK REVIEWS

Volume 3, Issue 1

ARTICLES

REVIEW ARTICLE

BOOK REVIEWS

Volume 3, Issue 2

ARTICLES

TRANSLATION

REVIEW ARTICLE

BOOK REVIEWS

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CONTENTS

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