

# Hylomorphism versus the Theory of Elements in Late Aristotelianism: Péter Pázmány and the Sixteenth-Century Exegesis of *Meteorologica* IV

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## Abstract

This paper investigates Péter Pázmány's theory of mixtures from his exegesis of *Meteorologica* IV, in the context of sixteenth-century scholarship on Aristotle's *Meteorologica*. It aims to contribute to a discussion of Anneliese Maier's thesis concerning the incompatibility between hylomorphism and the theory of elements in the Aristotelian tradition. It presents two problems: (1) the placement of *Meteorologica* IV in the Jesuit *curriculum* on physics and (2) the conceptualization of putrefaction as a type of substantial mutation. Through an analysis of these issues, it shows (1) how sixteenth-century exegesis imposes the hylomorphic thesis onto the subject matter of meteorology and (2) how the hylomorphic theory of substantial change can be adapted in order to accommodate the theory of elements. The case being made is that *Meteorologica* is a privileged place where hylomorphism and the theory of elements meet and that the late Aristotelian theory of mixtures sought to accommodate both theories of material substance.

## Keywords

hylomorphism – *Meteorologica* – mixtures – Anneliese Maier – Pázmány

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## Introduction: The Tension between Hylomorphism and the Theory of Elements

In 1943, Anneliese Maier published a thorough and influential study of the structure of material substance as posed by the theory of mixtures in Latin Aristotelianism.<sup>1</sup> It remains the only extended study of this problem to date, and its implications have rarely been discussed.<sup>2</sup> Aristotelianism, following Maier, conceived of material substances in two ways: on the one hand, bodies are composites of matter and form, but on the other, they are also mixtures of the four elements, earth, water, air and fire. Maier saw an irreducible incompatibility between these two views. Her strong thesis is that medieval philosophy never succeeded in reconciling Aristotle's hylomorphism with his doctrine of mixtures.<sup>3</sup>

Before Maier, Pierre Duhem had already suggested two opposite and conceptually exhaustive ways of thinking about the nature of mixtures: atomistically, looking for the ingredients of the mixture (and in doing so, understanding mixtures as aggregates of these ingredients); "peripatetically," seeing the mixture as a substance ontologically distinct from its ingredients.<sup>4</sup> Maier's work went further and placed this tension within Aristotelianism itself: there is a hylomorphic way of thinking about mixtures, concerned with generating and specifying the substantial form of the compound, and there is also an

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1 'Die Struktur der materiellen Substanz', in eadem, *An der Grenze von Scholastik und Naturphilosophie* (Rome, 1952; 1st edition Essen, 1943).

2 Other recent contributions on Latin Aristotelianism are largely based on Maier's work: R. Wood and M. Weisberg, 'Interpreting Aristotle on Mixture: Problems about Elemental Composition from Philoponus to Cooper', *Studies in the History and Philosophy of Science* 35 (2004), 698-704; R. Wood, 'The Influence of Arabic Aristotelianism on Scholastic Natural Philosophy', in *The Cambridge History of Medieval Philosophy*, ed. R. Pasnau (Cambridge, 2011), 247-266. "Aristotelian" and "Aristotelianism" will refer here to the Latin commentary on Aristotle as developed in the Western schools from the thirteenth to the seventeenth century; "of Aristotle," to Aristotle's texts; "commentary" and "exegesis" are taken in a broad sense, referring to Latin works preoccupied with Aristotle's corpus.

3 *An der Grenze*, 3: "die Scholastik hat nämlich nicht vermocht, für die Konstitution der materiellen Substanz, so wie sie sie zur Voraussetzung ihrer ganzen Naturbetrachtung und Naturerklärung machte, eine Deutung zu finden, die mit den Grundlagen ihrer Metaphysik in Einklang stand." *Ibid.*, p. 138: "Die Scholastik hat das Problem nicht gelöst, weil es für sie nicht lösbar war," and *passim*.

4 P. Duhem, *Le mixte et la combinaison chimique. Essai sur l'évolution d'une idée* (Paris, 1902; 1985), 11-15.

elemental way, concerned with specifying the composition of the compound, what it is made of and how can it be decomposed into its ingredients.

Maier showed the failure of medieval exegesis to resolve this tension in the much-debated question *utrum elementa maneat in mixto*: how are the forms of the elements kept in the compound, given that the compound should have its own form, but also that it should be able to resolve itself into the composing elements?<sup>5</sup> Maier thought it was a problem of the “system” itself, resolved only by the seventeenth century’s revival of the atomistic view of mixtures.<sup>6</sup>

An irreducible internal conflict in the Aristotelian concept of material bodies suggests that the problem would manifest itself in various places in the commentary tradition. Following Maier’s lead, I look for this tension in sixteenth-century commentaries on *Meteorologica*, taking them as a privileged place for discussions of matter theory and the theory of mixtures. The *Meteorologica* books deal with processes of gradual elemental transformation and with complex bodies—bodies that most of the time cannot be treated as Aristotelian individual substances and are recognized as aggregates. Meteors, as defined by the *Meteorologica* tradition, are precisely bodies “on the way of being mixt,” not yet full mixtures, but not pure elements either.<sup>7</sup> I will show how the sixteenth-century conception of mixtures relies on both theories of material substance, and I maintain that the best strategy for reducing the tension—at least, the best available to late-sixteenth-century commentators preoccupied with the coherence of Aristotle’s corpus—was to impose the hylomorphic thesis onto texts where Aristotle himself makes little use of it. Thus I hold, with Maier, that the tension between hylomorphism and the theory of elements is real in the sense that it is consciously perceived as such by commentators when confronting Aristotle’s text. But I also hold (and here I differ from Maier’s more rigid conclusions) that late-sixteenth-century

5 It is a *quaestio* on Aristotle’s *De generatione et corruptione* I, 10, well developed in Latin Aristotelianism. For a summary of the positions, see also Wood, ‘The Influence of Arabic Aristotelianism’.

6 *An der Grenze*, 3-4: “Es ist eines der Beispiele, wo jener Prozess der allmählichen aus inneren Motiven erfolgenden Lockerung und Auflösung der mittelalterlichen Weltanschauung—der sich ja im 14. Jahrhundert auf vielen Gebieten beobachten lässt—an einem Einzelfall sichtbar und begreifbar wird. Und zwar an einem Einzelfall, der grundsätzliche Bedeutung hat, eben weil an ihm in erster Linie sich die grosse Wandlung vom mittelalterlichen zum modernen naturwissenschaftlichen Weltbild vollzogen hat, und weil diese Wandlung zu einem wesentlichen Teil vorbereitet wurde durch das Versagen der Scholastik diesem Problem gegenüber.”

7 I take the expression from Albertus Magnus’ definition of the meteor as a simple body “proust est in via ad commixtionem.” *Opera omnia*, ed. A. Borgnet, 38 vols. (Paris, 1890-99) 4: 478a.

Aristotelianism is flexible enough to accommodate both theories, although doing so meant sometimes straying considerably from Aristotle's text, in a careful heterodoxy.

My engagement with Maier is thus not concerned with the conclusions of her investigation of material substance. It may very well be an inherent incoherence in the Aristotelian conception of sublunary bodies. But the material I use shows also a search for coherence that merits assessment. I want to think further about the meaning of this incompatibility for Aristotle's "system" as it was understood in the scholastic exegesis and pedagogical culture of the sixteenth century, a setting where Aristotle's *littera* came under heavy scrutiny.

It is well known that the sixteenth century witnessed unprecedented attacks on core Aristotelian doctrines, with such attacks coming from various directions, and most of the time from within the plurality of Aristotelianism itself. The metaphysics of matter and form inherited from the fourteenth century had little to do with Aristotle anymore.<sup>8</sup> It is also known how resistant to change the Aristotelian university course on physics was, and there is little room for illusions about its rigidity. My question, then, is this: how important was it for Aristotelian exegesis to maintain compatibility between hylomorphism and the theory of elements in the analysis of mixtures? Given that the theory of elements would ultimately win, on this point, in the seventeenth century, at the expense of hylomorphism, what kept the two theories together in Aristotelian physics?

In section I, I look at the extent to which sixteenth-century "meteorology" is indebted to hylomorphism, and in what way the pedagogical exegesis of Aristotle's *Meteorologica* reinforced the hylomorphic thesis while defining its subject matter.

In section II, I look at the problem of generation and corruption as posed by the theory of mixtures. Hylomorphism is not only a theory about the structure of bodies, but also, more importantly, a theory of change. As such, it comes together with a theory of the generation and corruption of individual bodies. I will thus look for the way in which the theory of mixtures accommodates both the hylomorphic model of change and elemental theory.

While taking into account other figures, the focus of my discussion will be on the work of the philosopher Péter Pázmány (1570-1637) and his lectures on Aristotle's *Meteorologica* IV. Pázmány is important in several ways: he is the leading Counter-Reformation figure in Central and Eastern Europe; he is a

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8 For the broad picture, see D. Des Chene, *Physiologia. Natural Philosophy in Late Aristotelian and Cartesian Thought* (Ithaca and London, 1996) and R. Pasnau, *Metaphysical Themes, 1274-1671* (Oxford, 2011).

well-informed and commendable philosopher in his own respect, who has been unduly neglected in the historiography; and he offers a well-articulated viewpoint on the way in which the Jesuit university course was developing at the end of the sixteenth century, particularly in response to challenges posed by the bolder exegesis of Veneto humanism.

The philosophical reader may need a short biographical summary. Péter Pázmány's brief but numerous philosophical writings have received relatively little scholarly attention outside of Hungary, although he is well known through his theological, political and missionary activity.<sup>9</sup> He was born in 1570 in Oradea/Nagyvárad, in the Principality of Transylvania. He converted from Orthodoxy to Catholicism as a child, either as a result of Jesuit missionary efforts or through the influence of his stepmother, who was a Catholic herself. He studied at the Oradea seminary and then at the newly founded Jesuit College in Cluj-Napoca. Entering the Society of Jesus, he completed his novitiate in Kraków, his philosophical studies in Vienna and his theological studies in Rome. Before launching a successful theological and ecclesiastical career (archbishop and primate of Hungary, he was the third Jesuit to be made a cardinal, after Toledo and Bellarmine, in 1629), Pázmány taught philosophy for three years at the newly founded University of Graz, from 1597 to 1600.<sup>10</sup> He published a number of philosophical disputations written during those years,<sup>11</sup> and he also wrote a notable philosophy course. Towards the end of his life, he started to prepare this course for publication as a manual for the University of

9 See P.R. Blum, 'Péter Pázmány: The Cardinal's Philosophy', in idem, *Studies on Early Modern Aristotelianism* (Leiden, Boston, 2012), 51-65. The Hungarian literature on Pázmány is extensive: see J. Adonyi and I. Maczák, *Pázmány Péter-bibliográfia: 1598-2004* (Piliscsaba, 2005), supplemented with E. Hargittay and I. Maczák, 'Pótlások a Pázmány Péter bibliográfiához', *Acta Historiae Litterarum Hungaricanum* 30 (2011), 160-183. A commented bibliography in English up to 1970 can be found in A. Tezla, *Hungarian Authors. A Bibliographical Handbook* (London, 1970), 455-461. See also, in English, P. Schimert, *Péter Pázmány and the Reconstitution of the Catholic Aristocracy in Habsburg Hungary, 1600-1650*, PhD thesis, University of North Carolina at Chapel Hill, 1989. Pázmány's works are published in two series as *Péter Pázmány Összes munkái, Magyar sorozat* (Collected Works, Hungarian Series), 7 vols. and *Petri cardinalis Pázmány Archiepiscopi Strigoniensis et primatis regni Hungariae Opera omnia, Series Latina*, 6 vols. (Budapest, 1894-1905). Hereafter *Opera* refers to this Latin series.

10 The last decades of the sixteenth century were years of fast and extremely successful re-Catholicisation for Eastern Europe. The Jesuit College of Graz was founded in 1578, in what was initially a largely Protestant city, and transformed into a university by the Archduke Charles II of Austria in 1586.

11 These disputations are re-edited in *Grazer philosophische Disputationen von Péter Pázmány*, ed. P.R. Blum and E. Hargittay (Piliscsaba, 2003).

Trnava (Nagyszombat), but he died before completing the project. The material on *Meteorologica* IV that I am concerned with is part of this university course, composed of several disputations held in class on topics from Aristotle's texts. An appendix will propose a more precise dating for these disputations.

## I Imperfect Mixtures and the Placement of *Meteorologica* IV in the Jesuit Physics Course

The *Meteorologica* is not a text to which medieval literature devoted excessive attention, in comparison to other areas of the Corpus Aristotelicum. Moreover, the idea that the fourth book of the *Meteorologica* should be separated from the first three has always been a suspicion in the exegesis literature, because the discontinuity between the texts is striking. *Meteorologica* I-III deal with meteors proper as formed by vapours and exhalations; *Meteorologica* IV speaks chiefly about the work of elemental qualities (hot, cold, wet and dry) and ends in a theory of organism. Early modern scholars also noted the separate career of Aristotle's *Meteorologica* IV in the corpuscular and alchemical traditions.<sup>12</sup> With the re-appropriation and printing of later Greek commentaries on the *Meteorologica* in the Renaissance, the question of the discontinuity of *Meteorologica* IV became more acute. Alexander of Aphrodisias' suggestion to remove the book and attach it to *De generatione et corruptione* (h. 179, 1-11) was discussed widely, and a renewed interest in *Meteorologica* IV developed.<sup>13</sup>

12 C. Lüthy, 'An Aristotelian Watchdog as Avant-Garde Physicist: Julius Caesar Scaliger', *The Monist* 84 (2001), 542-561; W.R. Newman, 'Corpuscular Alchemy and the Tradition of Aristotle's *Meteorology*, with Special Reference to Daniel Sennert', *International Studies in the Philosophy of Science* 15 (2001), 145-153; C. Viano, ed., *Aristoteles chemicus. Il IV libro dei 'Meteorologica' nella tradizione antica e medievale* (Sankt Augustin, 2002). The first to express doubt over the authenticity of the book was Francesco Patrizzi, *Discussiones peripateticæ* (Basel, 1581), 291-292. For an overview of the literature in the Renaissance, see C. Martin, *Renaissance Meteorology. Pomponazzi to Descartes* (Baltimore, 2011). For the Jesuit literature, see F. de Dainville, *La Géographie des humanistes* (Paris, 1940). The authenticity of *Meteorologica* IV was strongly questioned at the beginning of the twentieth century on grounds that it was too "mechanistic." An overview of the debate can be found in C. Baffioni, *Il IV libro dei "Meteorologica" di Aristotele* (Naples, 1981), 34-44 and E. Lewis, 'Introduction' to Alexander of Aphrodisias, *On Aristotle's Meteorology 4* (Ithaca, NY, 1996), 3-15.

13 See Alexander of Aphrodisias, *On Aristotle's Meteorology 4*, and idem, *Commentaire sur les Météores d'Aristote. Traduction de Guillaume de Moerbeke*, ed. A.J. Smet (Leuven, 1968). Besides Alexander's position (known since the thirteenth century), Olympiodorus recalls

Philological discussions turned naturally into discussions over the subject matter of “meteorology” itself.

Alexander’s proposal, advanced with the argument that *Meteorologica* IV deals with the powers of elemental qualities treated in *De generatione et corruptione*, was adopted by a number of authors. The widely circulated commentary of Francesco Vimercati, which followed Alexander in this respect, contributed to a large extent to the diffusion of the separation thesis.<sup>14</sup> By the late sixteenth century, this had become a hot topic, and treatises that dealt specifically with *Meteorologica* IV, separated from the other three books, began to accumulate, while the rest of the meteorological literature tended to limit itself to the first three books, excluding the fourth. The seventeenth century inherited this outcome. This division of Aristotle’s *Meteorologica* books, with the displacement of *Meteorologica* IV, is an under-researched feature of the historiography of early modern theories of matter.<sup>15</sup>

The exegetic discussion around *Meteorologica* IV reveals an interesting effort to accommodate hylomorphism and the theory of elements. I will take a closer look at the arguments through the eyes of Péter Pázmány. Pázmány was very much aware of the debate and of the recent contributions to it; attentive of Paduan and Roman developments, he made use of the most significant recent authors who wrote on *Meteorologica* IV: Pietro Pomponazzi, Francisco Vallés, Agostino Nifo, Francesco Vimercati and Jacopo Zabarella. His argument for the unity of the *Meteorologica* books is typical, and it shows how discussions over the placement of one of Aristotle’s books in the corpus decided philosophical issues over the structure of matter.

Pázmány lectured on the *Meteorologica* in 1598 and 1599, two disputations on the fourth book and a “treatise” on the first three books, already dividing the material (*Opera* 3: 415-552; see the appendix on the dating). For him, meteorology is the beginning of what could be called “applied physics” (what other authors around that time start to call *physica specialis*).<sup>16</sup> After laying out the general principles of natural generable bodies in the *Physica* and those of substantial transformation in the books on *De generatione et corruptione*, the course

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Ammonius for the opinion of keeping the book in its fourth place. Philoponus’ commentary on book IV does not survive.

- 14 F. Vimercati (Vicomercatus), *Commentarii in IV libros Meteorologicorum* (Paris, 1556).
- 15 See C. Martin, ‘Francisco Vallés and the Renaissance Reinterpretation of Aristotle’s “Meteorologica” IV as a Medical Text’, *Early Science and Medicine* 7 (2002), 1-30, for details on the career of *Meteorologica* IV in the sixteenth century and references to sources.
- 16 *Opera* 3: 454: “Inter philosophiæ naturalis partes unam esse diximus initio *Physicæ* [...] quam Aristoteles libris meteorologicis explicavit.”

continues with investigations meant to demonstrate the principles enunciated earlier through their natural effects, an *a posteriori* demonstration.<sup>17</sup>

Pázmány starts off by reporting on Alexander and Vimercati, who argue for the attachment of *Meteorologica* IV to *De generatione et corruptione* on account of the fact that the book deals with the operations of elemental or primary qualities, and only “accidentally” with mixtures, insofar as mixtures are the result of the said operations. This view puts more weight on the hylo-morphic theory, insisting on the operations of qualities as forms of bodies. Pázmány proposes, on the contrary, that *De generatione et corruptione* deals with primary qualities insofar as they are properties of the elements, whereas *Meteorologica* IV deals with qualities insofar as they are passions of mixed bodies.<sup>18</sup> This view puts more weight on the theory of elements, insisting on the difference between pure elements and mixtures. Going from *De generatione et corruptione* to *Meteorologica* IV would thus mark a passage from the principles of the constitution of matter (the elements) to the material bodies themselves (individual mixtures), from a *physica generalis* to a *physica specialis*. One can therefore define a field of study—“meteorology”—based on its own object of study, natural mixtures. The first three books of the *Meteorologica* deal with imperfect mixtures, while the fourth deals with perfect mixtures; together they compose a complete treatise on inanimate sublunary bodies.

But does the book stay true to this object of study? This leads us to the next disputed argument of the exegesis: whether *Meteorologica* IV deals with meteorological bodies or not (*Opera* 3: 415-416). Alexander and Vimercati, as expected, do not consider the book’s subjects “meteorological” (*meteorologicus*). According to this opinion, the unity of *Meteorologica* I-III would arise from the fact that Aristotle deals with bodies from the lower atmosphere (*in sublimi*) that have a common matter (the double *halitus*, the vapours and exhalations that make up the meteors in Aristotle’s theory). This common matter, extensively used in *Meteorologica* I–III, does not play a role in *Meteorologica* IV. And then there are conceptual advantages for the separation: Alexander’s solution would make *De generatione et corruptione* a complete and “coherent” treatise on all the substantial transformations that mixtures can

17 *Physica*, in *Opera* 2: 14: “[...] Nostra sententia, quam quod omnia tractata his libris <Phys.> sunt principia, causæ, passiones corporis naturalis generabilis, non ut hujus vel illius speciei sunt, sed solum ut sunt corpora generabilia.”

18 *Opera* 3: 415: “Sed <Alexander et Vicomercatus> decipiuntur [...] tum quia Aristoteles explicat hic operationes primarum qualitatum quatenus sunt passiones mixtorum, sicut in lib. *De generat.* explicatæ sunt primæ qualitates quatenus sunt proprietates elementorum.”

suffer. More importantly, without the treatment of the substantial transformations in *Meteorologica* IV, some of the discussions from *Meteorologica* I-III would be unintelligible: one cannot understand hail without congelation, nor the generation of stones without concretion.

For the arguments *pro*, Pázmány brings in the bulk of the commentary tradition on *Meteorologica* IV as authorities, overwhelmingly in favour of keeping the inherited structure of the *Meteorologica* books (Philoponus, Olympiodoros, Averroes, Albertus Magnus, Thomas Aquinas, Timæus [?]),<sup>19</sup> together with more recent authors such as Pomponazzi and Boccadiferro. Their view rests on somewhat forcedly assigning the common matter from *Meteorologica* I-III to the mixtures of *Meteorologica* IV: even if the two types of exhalations are not as present in this fourth book as in the first three, the mixtures dealt with here actually have the same material origin. They are ontologically the same type of bodies because they are made up of the same stuff, so they should be treated in the same manual.

This is a typical classroom disputation that offers a compendium of arguments together with the master's preference. There is a fine line between pure dialectics and the expression of attachment to one side or the other. But the discussion does decide one thing: meteorology is defined as a science of mixtures, having its own unity within the Aristotelian corpus. It need not deal with bodies of the upper atmosphere,<sup>20</sup> but with bodies of a certain type: whether aggregates (*Meteorologica* I-III) or perfect compounds (*Meteorologica* IV), they compose a science of natural mixtures directed by the theory of substance transformation from *De generatione et corruptione*.

I claim that, in this discussion about the nature of this field of study, we can read an imposition of the hylomorphic thesis onto Aristotle's material. What I characterize as an imposition is the definition of meteorology as dealing with *imperfect* and *perfect* mixtures. Aristotle did not speak of perfect or imperfect mixtures (I would go so far as to say that the concept of an imperfect mixture, not yet a mixture and still not an element, goes against Aristotle's metaphysics of substance), and the concept is an elaboration of the medieval tradition. The distinction between perfect and imperfect mixtures is dealt with by Pázmány in his fourth disputation on the *De generatione et corruptione* from the same teaching course, titled *De mixtione*. It is based on a hylomorphic criterion: if

19 Presumably a corruption of Thimo/Themon Judæus, the fourteenth-century Parisian master and commentator on the *Meteorologica*.

20 *Opera* 3: 417: "Tertio, ratio cur negant hunc librum esse meteorologicum est quia quæ hic tractantur non generantur in sublimi. At hoc nihil valet, nam non ea sola hic tractantur, sed quæ constant duplici halitu, qualia sunt hic explicata."

the new body receives a new substantial form, it is called a perfect mixture, it falls under the species of substantial generation, and it will be dealt with in *Meteorologica* IV; if the new body does not receive a new substantial form, but only accidents, it is called an imperfect mixture and will be dealt with in *Meteorologica* I-III. *De generatione et corruptione* lays down only the process itself.<sup>21</sup>

This is a commonly held opinion in the sixteenth century, and not only then. Current scholarship traces the division between perfect and imperfect mixtures back to fourteenth century discussions.<sup>22</sup> This is not a late medieval innovation, however, but one that builds on earlier treatments. Albertus Magnus, in his commentary, speaks of two ways in which the simple mobile body is considered in the *Meteorologica*: (1) from the point of view of the path towards mixture (*ex parte viæ commixtionis*), which is the material dealt with in Books I-III, or (2) from the point of view of the mixture itself (*ex parte ipsius commixtionis*), which is the material dealt with in Book IV.<sup>23</sup> By the time we get to Duns Scotus, we already have the full doctrine. In a *Sentences* discussion over baptismal water, requiring it to be pure and not mixed, Scotus puts forward the view as follows:

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- 21 *De generatione et corruptione*, in *Opera* 3: 389: "Mixtio interdum significat corporum diversæ rationis secundum minutas partes factam confusionem, ut fit cum cinis farinæ, aqua vino miscetur. Et hæc non sunt inter se unita ita ut unam entis speciem constituent. Aliquando sumitur pro mixtione imperfecta qualitatum in qua non producitur nova forma substantialis distincta a formis elementorum, sed nova tantum accidentia, ut fit in mixtis imperfectis vapore et exhalatione quæ non habent formam mixti diversam a formis elementaribus. Aliquando demum sumitur pro mixtione perfecta per quam producitur forma substantialis mixti de novo sive remaneant formæ elementorum, sive non."
- 22 C. Martin, *Renaissance Meteorology*, 159, n. 3, attributes "one of the first" occurrences of the term "imperfect mixtures" to Buridan's *Expositio libri meteororum* (unedited).
- 23 *Opera omnia*, 4: 478a: "Mobile autem simplex prout est in via ad commixtionem, determinatur in isto libro quem habemus præ manibus, qui dicitur *Meteororum*, qui continet secundam partem naturalis philosophiæ. Mobile autem hujusmodi consideratur dupliciter, scilicet ex parte viæ commixtionis, quæ est secundum quod unum elementum movetur in regione alterius per hoc quod alteratur ad ipsum per vaporem vel inspissationem: vel consideratur ex parte ipsius commixtionis, quæ fit per activam qualitatem unam vel plures, vel per passivas. Et mobile quidem simplex primo modo consideratum, determinatur in primis tribus libris *Meteororum*. Mobile autem simplex secundum modum commixtionis factæ per activas vel passivas qualitates, determinatur in libro 4. hujus scientiæ."

But making a mixture can be understood in two ways: in one sense, that from the mixed things a third thing is made one per se, or a perfect mixture, like at the end of the process of mixture, when bodies are composed of the four elements; or [in another sense it can be understood that] an imperfect mixture is made, in the process of becoming a perfect mixture, like the meteors of hail or snow.<sup>24</sup>

This is the first occurrence of the theory of perfect and imperfect mixtures that I have been able to find, but the context suggests that it was not something new in Scotus' time. In late-medieval discussions, the notion of *imperfecta mixta* as the subject matter of meteorology is omnipresent. The interplay of perfect and imperfect mixtures in the same book, separated ontologically into aggregates "in via" towards perfect mixtures and "complete bodies," will endure well into the seventeenth century; the distinction will remain, to my knowledge, undisputed in the meteorological literature until Descartes's *Météores* (1637).<sup>25</sup> It is

24 *Reportata parisiensia* IV, d. 3, q. 3, in *Opera omnia*, ed. Wadding-Vivès, 26 vols. (Paris, 1891-95), 23: 585a-b: "Sed mixtionem fieri, potest intelligi dupliciter: uno modo, quod ex mixtionibus fiat aliquod tertium per se unum, sive fit perfecte mixtum, ut in termino mixtionis, ut sunt composita corpora ex quattuor elementis, vel imperfecte mixtum, et in via ad perfectam mixtionem, cuiusmodi sunt impressiones gradinis et nivis." Cf. a more trustworthy, but less explicit text: *Ordinatio* II, d. 8, q. un., in *Opera omnia* (Vatican, 1950-), 8: 126-127. The question here is, which type of body can an angel assume? In cases where the angel assumes a body that is not caused by natural causes, like Raphaël, i.e., a body formed temporarily just for the angel's incarnation, that body can only be imperfectly mixed: "videtur probabile quod illud sit corpus mixtum [...] sed non mixtum plena mixtione [...] Itaque corpus, quod ita quasi subito formatur et resolvitur, est mixtum imperfecta mixtione." Scotus' test for a body to be imperfectly mixed in this text is immediate corruption: if the body is immediately resolved into its composing elements, then that body was an *imperfectum mixtum*; otherwise it would have passed through an intermediary stage, like a cadaver. The doctrine seems to be that the less stable a nature is, the more imperfect it is. Cf. *infra*, section II; see also my 'John Duns Scotus and the Aristotelian ontology of mixture', *Res Philosophica* 91.3 (2014), forthcoming.

25 Descartes mentions the view once in his treatise: "Puis à cause que ces vapeurs, s'élevant de l'eau de la mer, forment quelquefois du sel au-dessus de sa superficie, je prendrai de là l'occasion de m'arrêter un peu à le décrire et d'essayer en lui si on peut connaître les formes de ces corps, que les philosophes disent être composés des éléments par un mélange parfait, aussi bien que celles des météores, qu'ils disent n'en être composés que par un mélange imparfait." *Œuvres de Descartes*, ed. C. Adam and P. Tannery, 11 vols. (Paris, 1897-1913), 6: 232. Cf. also the entry on "Mixta, perfecte et imperfecte" from Goclenius' *Lexicon philosophicum* (Frankfurt, 1613, reprint Hildesheim, 1980), 693-694.

manifest for instance in Jean Baptiste du Hamel's popular title from the second half of the seventeenth century: *De meteoris et fossilibus: libri duo: in priore libro mixta imperfecta quæque in sublimi ahere vel gignuntur vel apparent fusè pertractantur: posterior liber mixta perfecta complectitur: ubi salium bituminum lapidum gemmarum & metallorum naturæ causæ & usus inquiruntur* (Paris, 1660). Another well-circulated manual, Libertus Fromondus' *Meteorologicorum libri sex* (Antwerp, 1627, with three subsequent editions), holds that it will not speak of stones or frogs that one finds in the sky, because these are perfect mixtures, and meteorology is only concerned with imperfect ones, i.e., with those mixtures that have not yet driven out the form of the element to introduce their own.<sup>26</sup>

More importantly, hylomorphic separation offered a way of pedagogically organising Aristotle's material in the physics course, in an *ordo doctrinæ*. The most used Jesuit manual of the seventeenth century, produced by Coimbra, is eloquent in this respect. The Conimbricenses present "meteorology" in the following way: after Aristotle dealt with the doctrine of the generation of common elements and other corruptible substances, he finally came to look at singular mixtures. These are of two kinds: mixtures according to quality (imperfect) or mixtures according to substance (perfect). The latter, in turn, can be divided into animate and inanimate, etc.<sup>27</sup> The investigation starts from the elements, continues with the imperfect mixtures and, finally, with the perfect ones, ending with *De anima* and the smaller biological works.

The hylomorphic theory of mixtures directs the discipline as it is shaped in the sixteenth-century Aristotelian literature. Turning to the subject matter of the course, the next section will show how the other facet of hylomorphism, the theory of generation and corruption, is similarly adapted to the theory of elemental mixtures.

26 L. Fromondus, *Meteorologicorum libri sex*, 1-2: "Corpus imperfecte mixtum nihil aliud est quam Elementum infectum qualitibus peregrinis. [...] Hæc mixtio vocatur imperfecta, quia nondum attingit perfectionem temperiei, quæ formam substantialem elementi expellat, & absolute mixti introducatur. [...] Itaque lapides, ranæ, et si quæ alia in sublimi perfecte mixta, ex vapore et exhalatione coagulantur, meteora non sunt, quia imperfecte mixta non sunt, cum abiecerint formam elementi."

27 *Commentarii Collegii Conimbricensis S. I. in libros Meteororum Aristotelis Stagiritæ* (Lisbon, 1592; I use the Lyon, 1616 edition, among the 112 known European editions of these manuals), proemium. The Coimbra authors retained the Alexandrine opinion about the placement of the books as "not devoid of probability," but chose to stick with the more traditional one, as *verisimilior* (without arguing).

## II Perfect Mixtures and the Model of Substantial Mutation: The Case of Putrefaction

The hylomorphic thesis is directly linked with the concepts of generation and corruption of substance as *immediate* processes. The principle that a new substance is generated at the exact moment when a new substantial form is introduced, and that a substance perishes when it loses its substantial form, is axiomatic for late-Aristotelian physics. Consequently, a material body's life-span ranges from generation to corruption.<sup>28</sup> Pázmány states this view as follows: "postquam res corrupta est, jam non est ipsa, sed aliud."<sup>29</sup> As opposed to generation and corruption, alteration is the process that expresses the gradual transformation of substance: it is a process of change of accidental forms, without resulting in a change of substantial form.<sup>30</sup>

Late-Aristotelian meteorological bodies are also submitted to this hylomorphic model of change. The distinction between substantial generation and mere alteration grounds the distinction between perfect and imperfect mixtures. Perfect mixtures (minerals, animals) arise from substantial generation, with the introduction of a new substantial form, while imperfect mixtures (clouds, hail) result from an alteration of the qualities of the elements, without introducing a new substantial form. As we have seen, it was commonly held that *Meteorologica* IV works with perfect mixtures: consequently they should be treated in terms of substantial (punctual) generation and corruption.<sup>31</sup>

28 For a discussion of generation and corruption in hylomorphic theory, see R. Pasnau, *Metaphysical Themes*, 552-557. Cf. Thomas Aquinas, *Summa theologiae* Ia, q. 76, a. 4, co.: "Forma autem substantialis dat esse simpliciter, et ideo per eius adventum dicitur aliquid simpliciter generari, et per eius recessum simpliciter corrumpi." Generation *simpliciter* or substantial generation, whereby a substantial form is introduced, is to be contrasted with generation *secundum quid*, or accidental generation, which equals alteration. Cf. a good discussion by Buridan, *De generatione et corruptione* I, q. 6 ("utrum possibile est aliquid simpliciter generari"), in *Quaestiones super libros De generatione et corruptione Aristotelis*, ed. M. Streijger, P.J.J.M. Bakker, and J.M.M.H. Thijssen (Leiden-Boston, 2010), 69.

29 *De putrefactione*, in *Opera* 3: 419. Cf. Pázmány's *De generatione et corruptione* I, disp. 1, q. 1, dub. 2, *Opera* 3: 118-119: "Est enim generatio quaedam transformatio unius compositi in aliud, qua mediante materia ex una forma ad aliam transmutatur."

30 Cf. Descartes explaining to Regius in a letter from December 1641, in *Œuvres* 3: 461: "Alteratio simplex est illa quæ non mutat formam subjecti, ut calefactio in ligno; generatio vero, quæ mutat formam, ut ignitio; et sane, quamvis unum alio modo non fiat quam aliud, est tamen magna differentia in modo concipiendi, ac etiam in rei veritate."

31 Pázmány, *De mixtione*, in *Opera* 3: 389: "Hæc ergo [...] mixtio sub generatione substantiali continetur, atque ideo convenit illi tota ratio generationis supra explicata, quod scilicet essentialiter sit mutatio totius in totum, etc. Est enim actio productiva substantiæ."

Generation, applied to mixtures, means aggregation from the four elements under the direction of a new form. Similarly, corruption will be the dissolution of the mixed body into the composing elements. Between generation and corruption, there are alterative processes. But what about more complicated “meteorological” problems, such as putrefaction, one of the topics discussed in Aristotle’s *Meteorologica* IV? Putrefaction is a case that challenges the hylomorphic model of immediate generation, gradual alteration and immediate corruption. It is both a gradual process, such as alteration, but it also expresses a loss of form, such as corruption. Pázmány’s exegesis of this topic of *Meteorologica* IV raises this precise challenge (*De putrefactione*, in *Opera* 3: 418-438).

The definition of putrefaction in Aristotle’s *Meteorologica* IV is ambiguous. Usually, the commentators reveal two senses in which Aristotle speaks of putrefaction: in one sense he is taken to speak of putrefaction as a case of corruption; in another sense he is taken to equate putrefaction with alteration.

The first sense is read into Aristotle’s definition of putrefaction as the opposite of (substantial) generation in natural things:

[Text A, 379a 3-5] But the strictest general opposite of unqualified becoming [= *generatio*] is putrefaction. All natural destruction is on the way to it, as are, for instance, growing old or growing dry. Putrescence is the end of all these things, that is of all natural objects, except such as are destroyed by violence.<sup>32</sup>

However, immediately after Text A, where Aristotle defines putrefaction as a case of corruption, he talks about a “special sense” of decay as a partial destruction, which will be read by the commentary tradition as a case of alteration: [Text B, 379a 13-15] “in a special sense the word putrefaction is applied to partial destruction, when a thing’s nature is perverted.”

I will call Aristotle’s two senses of putrefaction meaning A (= corruption) and meaning B (= alteration).

This textual equivocation will generate a peculiar career in the commentaries. Outside the literature on *Meteorologica* IV, putrefaction is usually discussed in the medical literature, together with its counterpart, concoction. Putrefaction is the most important cause of disease, the origin of fevers or the cause of plagues (through the putrefaction of the air). Concoction or digestion is the process through which putrefaction is countered, by generating new

32 Trans. E.W. Webster in *The Complete Works of Aristotle. The Revised Oxford Translation*, ed. J. Barnes, 2 vols. (Princeton, 1984).

matter. Commentaries on Galen's *Techne iatrike* (known in medicine as *Ars medica*, *Ars parva*, *Microtegni* or *Tegni*) invariably refer to Aristotle's discussion of putrefaction in *Meteorologica* IV, with a therapeutic scope: if putrefaction is caused by the victory of the passive qualities over the active ones, as per Aristotle's teaching (*Meteorologica* IV: 379a1-5), then one should be able to influence their mix for the betterment of the affected body.<sup>33</sup> Consequently, Galenists take putrefaction to have a certain latitude: a gradual invasive process, it can be healed up to a point, as long as it has not reached a degree of corruption that affects the entire substance. However, the treatment of putrefaction in this medical literature is at odds with Aristotle's meaning A, of putrefaction as a case of corruption. Confronting this tradition, Pázmány puts the question in direct ontological terms: is putrefaction a case of substantial corruption, as Aristotle says, or is it a case of alteration? What is it *formaliter*, asks Pázmány?

He acknowledges "big difficulties in this question" (*Opera* 3: 418). The commentators he refers to are Alexander and Vimercati, who according to him ignore the issue (and indeed they do); Pomponazzi, who rests undecided on the matter in spite of treating it extensively in a number of his *dubitationes*; Petrus Turrisanus, the commentator on Galen, and another Paduan, Gaetano da Thiene, both of whom take putrefaction to be a case of alteration.<sup>34</sup> Since the problem is not extensively discussed in the commentary literature in these

33 See P.-G. Ottosson, *Scholastic medicine and philosophy: a study of Commentaries on Galen's Tegni (ca. 1300-1450)* (Naples, 1984). For putrefaction in Galen, see R.E. Siegel, *Galen's System of Physiology and Medicine* (Basel, 1968), 169-170.

34 Vimercati, *Commentarii in IV libros Meteorologicorum*, although he has an extensive commentary on putrefaction, does not address the ontological matter; Pietro Pomponazzi, *Dubitationes in quartum Meteorologicorum Aristotelis librum* (Venice, 1563), 18-19; Pietro Torrigiano de' Torrigiani (known as Drusianus/Turisanus et al., ca. 1270-ca. 1350), *Plus quam commentum in parvam Galeni artem . . . cum duplici textus interpretatione, antiqua scilicet & Leonicensi, & eiusdem libello de Hypostasi . . . Martianus Rota . . . auxit & emendavit*, lib. III, comm. 5 (Venice, 1557), 102-103 ("utrum putrefactio sit alteratio secundum totam substantiam"); Gaetano da Thiene (1387-ca. 1465), *In quatuor Aristotelis meteororum libros expositio*, lib. IV, tr. I, c. 2 (Rouen, 1476; Venice, 1491 et al.). These authors recognize and discuss the "æquivocatio" in Aristotle's pronouncement on putrefaction as both a case of corruption and a path to corruption. (Strangely enough, for Pomponazzi, Pázmány sends the reader to "dub. 23, 25, 26 etc.," omitting precisely the Dub. 24, pp. 18-19, where the issue is actually taken up.) Commentators who do not take into account the Galenic understanding of putrefaction as alteration normally do not have this problem and take it to be a case of corruption.

ontological terms (among his sources, Gaetano da Thiene is really the only one who takes up the issue), Pázmány will have to come up with his own solution.

There are three types of problems that Pázmány has with Aristotle's account (*Opera* 3: 418): (I) it is textually contradictory ("Aristoteles videtur sibi in hac re repugnare"); (II) it goes against the view of the medical tradition ("Secunda difficultas. Aristoteles videtur Galeno et medicis adversari"); and (III) there are conceptual difficulties in formally defining putrefaction the way that Aristotle wants to do ("rationes sunt contra Aristotelem"). He expands on (I) and (III).

**(I) *Aristoteles videtur sibi in hac re repugnare***

One textual contradiction is in the temporal placement of putrefaction in the sequence of substantial mutation. Aristotle explicitly says (1) that corruption *precedes* putrefaction, as a path towards it, while he explains next (2) that putrefaction occurs through the loss of natural heat; but (3) the loss of natural heat, as in animals, is a case of corruption of substance, therefore (4) corruption comes *after* putrefaction. Claim (4) contradicts (1).<sup>35</sup> Another textual contradiction: when Aristotle claims that putrefaction is the maximum contrary to generation, he makes it *formaliter* a case of corruption; but this contradicts Aristotle's second definition of putrefaction as a *path* towards corruption, which would make putrefaction a path towards itself.<sup>36</sup>

**(III) *Rationes sunt contra Aristotelem***

(1) There is a logical contradiction in the definitions of the concepts: putrefaction cannot be posterior to corruption because corruption is supposed to be the ultimate state of a body as *that* body. There is strictly speaking nothing post-corruption. If putrefaction occurs after the corruption of the body, it cannot be assigned to the same body, but to another body (say, the corpse generated by the corruption). A counterargument would be that Aristotle never says that putrefaction has to occur *in the same body* as corruption. But if we apply putrefaction and corruption to different bodies, there is no sense in which we can decide whether putrefaction leads to corruption, as per Aristotle's text, or

35 *Opera* 3: 418: "Textu enim 3. hic docet corruptionem præcedere putrefactionem, et corruptionem viam esse ad putrefactionem. At inferius text. 6 vult putrefactionem esse deperditionem naturalis caloris, ex quo sequitur putrefactionem præcedere corruptionem. Prius enim debet naturalis calor deperdi quam animal moriatur."

36 *Opera* 3: 418-419: "In hoc text. 3. dicit putrefactionem esse maxime contrariam generationi simpliciter. Ergo putrefactio est formaliter corruptio. [...] At in hoc text. 3. dicit corruptionem esse viam ad putrefactionem. Ergo idem via ad se."

vice versa, since there would be no causal connection between the body prior to corruption and the body generated after corruption.<sup>37</sup>

(2) The second conceptual contradiction that Pázmány reveals is more interesting for us, because it expresses the tension between hylomorphism and the theory of elements: *putrefaction of mixtures is both a gradual process and an immediate one*.<sup>38</sup> Take the case of a complex mixture (blood, wine, or a cadaver). The decomposition of a complex mixture can be seen as both an *infinite* process and a *finite* process. As an *infinite* process, the corruption of one mixture leads to the generation of another, down to infinity: e.g., from a living animal to a corpse and then to earth, from earth to plants, etc. This type of process is submitted to Aristotle's axiom of unceasing change, that the generation of one thing is the corruption of another, and vice versa (*De generatione et corruptione*, 318a23-25). As a *finite* process, the decomposition of a complex mixture should reach at its lowest level a certain simple mixture that is then *immediately* corrupted, i.e., it is immediately dissolved into the elements. In such a case, according to Pázmány, we have corruption that does not lead to any generation, and this goes against Aristotle's axiom of unceasing change.

### *Pázmány's solution*

Pázmány proposes a series of refinements of the concept, in four stages.

(1) Putrefaction is "a sort of" corruption ("Putrefactio formaliter est quædam corruptio," *Opera* 3: 419). This definition needs to be kept as it has the advantage of explaining well a number of Aristotle's phrases in the text at hand. A putrefied thing is as far away from its substance as it can get ("quia omnes nomine putrefactionis intelligunt non modo corruptionem, sed etiam cum dicimus aliquid esse putridum, maxime remotum esse a sua substantia: ergo" *Opera* 3: 419-420). As a corollary, this does a good job accommodating Aristotle's treatment of putrefaction as the loss of heat from *Meteorologica IV*, 379a17-26 ("putrefactio est corruptio caliditatis propriæ et secundum naturam,"

37 *Opera* 3: 419: "Quia dicit putrefactionem corruptione posteriorem esse, quod fieri non potest quia corruptio est ultimum in quod res abit; ergo nihil est post corruptionem. [...] Postquam res corrupta est, jam non est ipsa, sed aliud: ergo si post corruptionem sit putrefactio non eadem res putrescet et corrumpetur [...] Dices: non dicit Aristoteles putrescere esse posteriorem corruptione ejusdem rei. Sed corruptionem unius esse ante putrefactionem alterius. [...] Nam cum text. 27. 1. De generat. dicatur corruptio unius esse generatio alterius."

38 *Opera* 3: 419: "Putrefactio est ipsa formalis corruptio quorundam mixtorum, ut vini, sanguinis, cadaveris, etc. Præterea vel erit infinitus processus vel deveniendum tandem est ad aliquod mixtum quod immediate putrescat."

*Opera* 3: 429): in the case of animals, the loss of heat indeed results in a corruption of substance.

(2) Putrefaction, Pázmány adds, is not just corruption; it also “implies” (*connotat*) the alteration prior to corruption:

I understand putrefaction as a certain substantial mutation, but one that implies (*connotat*) its precedent alteration, so that although formally it is said to be a corruption, it also signifies (*connotat*) an alteration.<sup>39</sup>

This modification should explain that putrefaction happens in time, which one cannot say about corruption (“at in tempore non fit corruptio sed alteratio precedens,” *Opera* 3: 420). The key here is the verb *connotare*: even though formally putrefaction is a case of corruption, it also “signifies with it” (*connotat*) the alteration through which the corruption actually takes place.

This definition, according to Pázmány, should solve the formal concept. Up to here, Pázmány’s advancement is to say that the concepts of corruption and alteration need to be joined together in a single concept in order to account for the physical phenomenon. This amounts to little more than a change of terms, but it responds to that general demand of Aristotelianism to solve problems both *in voce* and *in re*. *In re*, however, he still has the problem of deciding between the anteriority or posteriority of putrefaction with respect to corruption.

(3) Experiential evidence indicates that there must be a certain way in which we can say that putrefaction follows corruption. This appears to be so in animals and plants, which first die and then putrefy (*Opera* 3: 420). But, as a counter-example, meat putrefies before being dissolved into the elements. *In re*, putrefaction both precedes and follows corruption.

To solve this, Pázmány decomposes the ontology of mixtures based on generation and corruption to allow an understanding of *successive substantial mutation of mixtures*. This will modify the understanding of a body as delimited by absolute corruption and absolute generation (*postquam res corrupta est, jam non est ipsa, sed aliud*).

(4) Putrefaction is not just *any* corruption or just *any* alteration. It is the ultimate corruption of a thing, which “connotes” (signifies simultaneously) the

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39 *Opera* 3: 420: “Per putrefactionem intelligimus aliquam mutationem substantialem, sed ut connotat alterationem præcedentem, ita tamen ut formaliter dicat corruptionem, connotet alterationem.”

alteration that takes place just before this last corruption.<sup>40</sup> In order to understand this, Pázmány says, we must take substantial mutation as composed of a series of sequential corruptions and generations, parts getting corrupted and generating other parts out of that corruption until forming the final substance. If this is so, in the series of generations and corruptions that make up a mixed body through successive states, one can point to the ultimate corruption of a thing as its putrefied state, together with the alteration that leads to it:

In simple speech, one thing has only one corruption, as one is the essence that gets lost through corruption; yet considering the multitude of things, there is an infinity of corruptions, since the generation of one thing is the corruption of another. But according to common opinion and sense and even according to reason, in a certain sense one thing has many generations and corruptions, and one can distinguish the last generation and the last corruption.<sup>41</sup>

The example is taken from the case of the most perfect mixtures, like animals, which, because they are so distant from the elements, cannot travel across natures directly, but only through a series of successive median states. These perfect mixtures are produced from the elements out of many subordinated generations: juices are generated out of the elements, out of the juices, herbs, out of the eaten herbs, the chyle, out of the chyle, the blood, out of the blood, sperm, out of sperm the embryo and out of the embryo, the animal. If this is so, one can distinguish the first generation, that of the transmutation of the elements into the juice, and the last generation, the generation of the animal. In the same sense, in a resolution from the perfect mixture down to the elements, nature does not traverse one mutation, but many mutations. Man is corrupted into a cadaver (the first corruption), and the cadaver is corrupted further into the elements (the last corruption).<sup>42</sup>

40 *Opera* 3: 421: "Putrefactio non est quæcunque corruptio sed ultima, nec connotat quamcunque alterationem sed quæ præcedit ultimam corruptionem."

41 *Opera* 3: 421: "Simpliciter loquendo unius rei una est corruptio, sicut una est essentia quæ per corruptionem perditur, plurium tamen rerum infinitæ sunt corruptiones, cum unius generatio sit corruptio alterius. Secundum tamen sensum et communem hominum opinionem et rationem etiam, aliquo modo unius rei sunt plures generationes et corruptiones, et reperitur prima et ultima generatio et corruptio."

42 *Opera* 3: 421: "Eodem modo a mixto perfecto ad elementa non transit natura unica mutatione sed pluribus, ita homo corrumpitur in cadavere, cadaver resolvitur in elementa, illa ergo corruptio per quam perditur mixtum perfectum dicitur prima corruptio, per quam resolvitur in elementa dicitur ultima."

Although Pázmány does not provide any authority for this view, but presents it as founded in “common opinion, sense, and reason,” an immediate source in hylomorphic theory is Thomas Aquinas’ account of the succession of forms.<sup>43</sup> According to Thomas, when a form is very distant from elemental matter, like in animals, there is a graduation towards the ultimate form that passes through a series of intermediary forms. Thomas exposes this view in a series of texts, and the reader can refer to *Summa theologiae* I<sup>a</sup>, q. 118, a. 2, ad 2, *Summa contra gentiles*, lib. 2, c. 89, n. 11, and *De potentia*, q. 3, a. 9, ad 9. Although we do not have an exposition on *Meteorologica* IV from Thomas, one can assume a compatibility between Pázmány’s solution and Thomas’ views on complex generation.

Thomas’ account is motivated by the theory of species: as long as the species is not affected, there can be any number of successive generations and corruptions. Nevertheless, Thomas, as far as I know, always gives this view in the context of explaining the generation of animals.<sup>44</sup> A compatible (though simpler) view with respect to putrefaction proper can be found in Albertus Magnus’ commentary (*Lib. IV Meteor.*, tract. I, cap. III, in *Opera omnia*, ed. A. Borgnet, 4: 710b-711b). For Albert, there are two distinct types/senses of generation: the universal generation of substance, the contrary of which is the destruction of substance (*corruptio*), and generation as applied to mixtures (“generatio mixti naturalis secundum quod mixtum est”), the contrary of which is putrefaction. Pázmány does not arrive at an original conception of putrefaction, however interesting his argumentation may look. While there is not a lot of discussion on this outside of the medical literature, it is a doctrine that one can find in other Jesuit commentaries on *Meteorologica* IV. One example is Sylvester Maurus’ Aristotelian manual of 1668, which presents Albert’s view on the

43 Pázmány knew his Thomas well: his lectures on the *Summa theologiae* form three volumes of the Latin *Opera* (4, 5 and 6). However, he only lectured on the second and third parts.

44 It seems that the philosophical origin of the theory of complex generation is indeed the explanation of the generation of animals; one author, Simon of Faversham (ca. 1260-1306), reported by R. Zavalloni, *Richard de Mediavilla et la controverse sur la pluralité des formes* (Louvain, 1951), 255, n. 31, contrasts the “simple generation” of minerals and the successive generation of man: “Quoniam cum homo sit perfectissimus, non generatur una generatione, sicut mineralia, sed primo inducitur vegetativa, et hac recedente, succedit ei sensibilis, et ista recedente, infunditur intellectus qui habet omnia hæc virtute” (*Quæstiones super III De anima*, q. 2).

distinction between *absolute* generation and corruption and *natural* generation and corruption, where natural corruption equals putrefaction.<sup>45</sup>

Pázmány does provide a commendable commentary on this particular Aristotelian text, with respect to what can be found elsewhere. His remaining discussion on putrefaction and concoction will be devoted to presenting advantages of this theory of material substance over the difficulties encountered in the commentary tradition on *Meteorologica* IV. Aristotle must not have meant that putrefaction is posterior to all corruption, but only to the series of corruptions that precede the last one. Similarly, he must have spoken of corruption as a “path” to putrefaction referring to this series of corruptions, minus the last one (*Opera* 3: 423). And crucially, Pázmány’s solution of successive mixtures also solves the contradiction with the Galenic view of putrefaction. Because the mixed body is composed of parts, some of its parts can be corrupted and putrefy before the putrefaction of the whole, and thus they are susceptible to healing. The alteration alone minus the ultimate state of corruption is the putrefaction that the Galenists can speak of and repair through expurgation (*Opera* 3: 424).

### Conclusions

I have argued, with respect to Maier’s thesis on the irreducible tension between hylomorphism and the theory of elements, that there is a coherent view of their compatibility at work in sixteenth-century commentaries on *Meteorologica*. Pázmány’s disputations offer a number of elements for this argument. On the one hand, there is evident pressure to use the thesis of hylomorphic composition in drawing up solutions to textual problems in Aristotle: from the definition of meteorology as a science of mixtures and the place of Book IV in the corpus (section I) to a more flexible reading of Aristotle’s concepts of generation and corruption (section II). This is one case of organic accommodation between two matter theories that need not necessarily be viewed as rivals.

As shown in the first section, the tendency of Aristotelian exegesis to impose a certain coherence over the material in Aristotle’s *Meteorologica* books is

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45 Sylvester Maurus, *Aristotelis Opera quae extant omnia, brevi paraphrasi ac litterae perpetuo inhaerente explanatione illustrata*, 6 vols. (Rome, 1668), 3: 654-656. A similar view is in Agostino Nifo’s *Subtillissima Commentaria in liros meteorologicorum & in librum de Mistis, sive Quartum Meteororum* . . . (Venice, 1560), 537: corruption applies to both mixtures and simple bodies, while putrefaction applies only to mixtures.

commonplace in the sixteenth century. But innovation is not Pázmány's goal; defence is. Pázmány's view on the placement of *Meteorologica* IV, though common, did not go unchallenged, as seen from the reported opinions of Alexander and Vimercati. The challenge led the Jesuit university course to argue more forcefully for the coherence of the *Meteorologica* corpus, applying the well-established theological routine of enforcing orthodoxy in the face of heterodox challenges. In doing so, the path chosen was hylomorphism: mixtures are divided into perfect and imperfect according to their hylomorphic constitution, whether they receive their own form or not. The Aristotelian corpus will be organized accordingly.

Pázmány's discussion over the proper order of Aristotle's books should count against a certain pervasive view in the literature that opposes the heterogeneity of the Aristotelian university course, dictated by the fragmentation of Aristotle's text, to a much tighter epistemological articulation of the "moderns."<sup>46</sup> This view may hold for the commentaries of the masters of the Middle Ages, and it certainly can be argued for on a case-by-case basis. But it seems to me that the effort of the late sixteenth century, and especially that of an organisation centred on pedagogical excellency such as the Society of Jesus, aims precisely at reaching a sound epistemological basis for its teaching. Given the fragmentary nature of Aristotle's corpus and the monolithic reading to which the Latin commentators tended, this effort was accomplished, within Aristotelianism, through an effort of synchronic interpretation whose unquestioned core was the hylomorphic thesis.

The imposition of the hylomorphic thesis goes beyond the arrangement of the corpus according to its ontology, into the explanatory accounts themselves. In his treatment, Pázmány takes the theory of the succession of forms one step further from Thomas to apply it to all mixtures, whether animated or not. Given that putrefaction is a process that affects all mixed bodies, a process that stops only at the level of the elements, and given that this process rests on the theory of intermediary forms, hylomorphic successiveness characterizes *all* mixtures. The progression of his argument shows how he is pressured to do so by the elemental theory of mixtures: one needs to account for the aggregation

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46 As an example of this view, Ugo Baldini writes in his excellent study of Jesuit physics that "dato che le opere aristoteliche non hanno un andamento strettamente concatenato, la serie [delle quæstiones] non corrispondeva a un ordine logico, ma solo a uno testuale. L'assenza del primo è forse la differenza più rilevante tra un corso « fisico » scolastico e uno moderno," etc. U. Baldini, *Saggi sulla cultura della Compagnia di Gesù (secoli XVI-XVIII)* (Padua, 2000), 243.

of the elements and the resolution into the elements. In this analysis, elemental theory and hylomorphism are both used.

Was it a search for compatibility between the two theories? One can look at the rigidity of the Aristotelian hylomorphic framework, expressed in the concepts of *immediate* generation and *immediate* corruption, and see the view of the succession of forms as forged precisely to accommodate the theory of mixtures. This accommodation was already a common ground for the late-medieval understanding of material substance. Aristotle's hylomorphism was not exactly the framework in which the sixteenth century read Aristotle's natural philosophy; it was a version of it forged by earlier medieval masters.

It would be too much to claim, by tracing this filiation, a direct influence of Thomas on Pázmány on this precise point, for the simple reason that Thomas does not have a commentary on the text. But Pázmány does have Thomist views on physical matters. He adheres to typical Thomistic doctrines, such as the potency of matter, to the idea of individuation through matter or the doctrine of a single substantial form in individuals. It is known that the first generations of Jesuits leaned more towards Thomism than authors of the second half of the seventeenth century, and that this leaning was especially strong during Claudio Acquaviva's office as Superior General (1581-1615), which covers the date of our text. That being said, the view of the sequential generation of parts in the animal was widespread, it was fairly well supported by common experience, and it was taken to rest on Aristotle's axiom of unceasing change, that the generation of one thing is the corruption of another, and vice versa.

I do take Thomas as the prominent reference for this position because I understand the view of the succession of forms to be linked with unitarianism. The *Thomistæ* are the prime defenders of unitarianism (i.e., the position that an individual substance has one single substantial form) against the pluralists (i.e., holders of the view that multiple forms coexist in the same individual).<sup>47</sup> Aristotle's axiom of unceasing change, to which the view of the succession of forms appeals, entails a causal order that precludes multiple forms of integral parts to be present simultaneously in the final mixture.<sup>48</sup>

47 For a good overview of the issue, extensively discussed in medieval scholarship, see F. Suárez, *Disputationes metaphysicæ* XV, sec. 10. Cf. also Pázmány's discussion in *Physica*, disp. III, q. 3, in *Opera* 2: 139-165, where he argues against pluralism.

48 Cf. a passage from Buridan, *De generatione et corruptione* I, 7, ed. Streijger, Bakker, and Thijssen, 77, which makes explicit the link between unitarianism and Aristotle's axiom: "Sed si poneretur quod in nullo eodem supposito sunt simul plures formæ substantiales, tunc universaliter esset dicendum quod omnem generationem unius substantialem comitatur corruptio substantialis alterius."

The sequential order of several generations and several corruptions of parts expresses the diachronic evolution of mixtures. The succession of forms in mixtures thus counts against the view where the forms of parts are generated and kept as generated in the mixed body. Pázmány's text insists on the linearity of the sequence: *prima generatio, ultima corruptio*, and everything in between.

To help put the status of this issue into perspective, a look at the situation later in the seventeenth century may help. In 1646, the Jesuit Niccolò Cabeo published four volumes on the *Meteorologica*, when corpuscularianism was already the philosophy of the day. He distinguished there between the "metaphysical principles" of matter, form and privation, as abstracted by the intellect from one singular entity, and the "physical principles" of the elements as ingredients. Cabeo, attached to corpuscularianism, does not see any incompatibility in a double determination of matter; they are just two different levels of analysis.<sup>49</sup> The split between a "metaphysical" doctrine of hylomorphism and a "physical" doctrine of the elements is not there yet in Pázmány; they coexist and work together in exegetical practice.

#### Appendix: Note on the Dating of Pázmány's Disputations on *Meteorologica IV*

Significantly, Pázmány's own disputations over *Meteorologica IV* are separated from the rest of his lectures on *Meteorologica* in the text that we have. They are placed in the *Opera Omnia* edition and in the manuscript between the lectures on *De generatione et corruptione* and those on *Meteorologica I-III*. The arrangement reflects the Alexandrine opinion of attaching *Meteorologica IV* to *De generatione et corruptione*. This is confusing, because Pázmány himself argues against the separation of the books, as we have seen in section I. It seems that he is not following his own preaching.

The editor of the *Physics* in the nineteenth century *Opera omnia*, Stephan Bognár, writes in his preface: "Item quartum librum Meteorom, qui nihil de meteoris proprie dictis continet, et plerisque ad libros De generatione spectare videtur, statim post libros De generatione spectare, ante tres priores libros meteorologicos explicat" (*Opera* 3: vi). This statement goes against Pázmány's argumentation in the text of his lectures on *Meteorologica IV*, but reflects the status of the manuscript. Paul Richard Blum, after following the manuscript, concludes that "[The treatise on *Meteorologica I-III*] follows the previous

49 *Philosophia experimentalis, sive In quatuor libros meteorologicorum*, 4 vols. (Rome, 1686, first edition 1646), 4: 4-5. On Cabeo, see C. Martin, *Renaissance Meteorology*, 106-124.

lectures [*De mixtione*, commenting on *De generatione et corruptione* I, 10, and the two disputations on *Meteorologica* IV] both in terms of its content and chronologically, so that it could have started in December 1599; on the other hand, however, Pázmány seems to have lectured on meteorology already in the winter of 1598/99. We have no further information that could shed light on this question.<sup>50</sup> Ironically, the exegesis of Pázmány today faces the same problem Pázmány's exegesis of Aristotle had: where to place *Meteorologica* IV?

I maintain that the disputations on *Meteorologica* I-III must have been held by Pázmány before those on *Meteorologica* IV.

The edition of the *Physics* in the *Opera omnia* is based on an autograph manuscript held by the Budapest University Library, on which Pázmány wrote diligently the dates when he held the lectures.<sup>51</sup> The manuscript of *Disputatio de mixtione* (covering *De generatione et corruptione* I, 10) is dated 4 November 1599; the two disputations on *Meteorologica* IV, entitled *De putrefactione* and *De concoctione*, undated, follow *De mixtione* in the manuscript. They are written on the same paper with *De mixtione* and actually continue the text from recto to verso, so there is no doubt that the disputations on *Meteorologica* IV are meant to follow directly. The manuscript of the following disputations, titled *De rebus meteorologicis Disputationes* and covering material from *Meteorologica* I-III, is dated by Pázmány 18 November 1598/11 December 1598. It is bound on separate sheets in the codex, so it was written separately.<sup>52</sup>

Thus the proper sequence is this: Pázmány lectured on *Meteorologica* I-III in 1598-1599 (*De rebus meteorologicis Disputationes*) and returned in autumn 1599 to lecture on *De generatione et corruptione* I, 10 (*De mixtione*), and on *Meteorologica* IV (*De putrefactione* and *De concoctione*). This is consistent with practices at other Jesuit schools, where the *Meteorologica* was taught as an interlude between lectures on the first and on the second book of *De generatione*

50 Blum, 'The Cardinal's Philosophy', 55.

51 Budapest, Egyetemi Könyvtár (University Library of Eötvös Loránd University), ms. cod. F 6. There are two manuscripts at this shelf mark, of which one is the autograph. The non-autograph manuscript is not very helpful, because it contains only the disputations on *Physics* and *De generatione et corruptione*.

52 For the *De mixtione* (including *Meteorologica* IV), the date is "In scholis coepi 4 Novemb. 1599 quo die post vacationem studiorum." For the *De rebus meteorologicis* (*Meteorologica* I-III), the date is "18. Novemb. 1598 Græcii in scholis coepi 11 Decemb. 1598 cum propter pestem in scholis pergere in physica non possem." These dates are also reported by Blum, 'The Cardinal's Philosophy', 54-55. Blum clarifies the reference to the plague: it appears that Graz was closed in the winter of 1598/1599 because of an outbreak.

*et corruptione*;<sup>53</sup> it also shows the variation that the *Meteorologica* IV itself is split from the rest of the books by one year. A text from Pázmány's *proemium* to *Meteorologica* I-III, where he announces the lectures on *Meteorologica* IV, confirms this dating.<sup>54</sup> Consequently, Pázmány's entire discussion on the subject of *Meteorologica* IV, meant to resist the Alexandrine thesis and to keep Book IV in place after I-III, was followed in class.

This philological element confirms the epistemic connection between the treatment of mixtures in *De generatione et corruptione* and the subject matter of *Meteorologica* IV.

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53 These are the years of the elaboration of the Jesuit *ratio studiorum*. In the 1599 version, the *Meteorologica* is placed after *De Coelo* and before the second book of the *De generatione et corruptione*, which got separated from the first by one year. *Monumenta pædagogica Societatis Iesu*, ed. L. Lukács, 7 vols. (Rome, 1974-92), 5: 355.

54 *Opera* 3: 455: "Tribus disputationibus complectemur ea quæ Aristoteles tribus prioribus libris tradit [...] nam de mixtis perfectis inanimatis, metallis scilicet lapidibus, etc., et de putrefactione, concoctione de quibus Aristoteles 4. Meteor., *alibi commodius agemus*," my emphasis.