

# Heavenly Animation as the Foundation for Fracastoro's Homocentrism: Aristotelian-Platonic Eclecticism beyond the School of Padua

Pietro Daniel Omodeo  
Ca' Foscari University of Venice  
ERC *EarlyModernCosmology*

## Abstract

This essay deals with the ensouled cosmology propounded by the physician and philosopher Girolamo Fracastoro. His *Homocentrica sive de stellis* (1538), which propounded an astronomy of concentric spheres, was received and discussed by scholars who belonged to the cultural environment of the Padua School. Paduan Aristotelians generally explained heavenly motions in physical terms as the effect of heavenly souls and intelligences. Since the time of the polemics over the immortality of the *human* soul, which had famously opposed Pomponazzi to Nifo, all psychological discussions—including those about *heavenly spheres'* souls—raised heated controversies. In the wake of these controversies, Fracastoro discussed the foundations of his homocentric planetary theory in a dialogue on the immortality of the soul entitled *Fracastorius, sive de anima* (1555). This work also included a cosmogonic myth which was, however, not published in early-modern editions of the dialogues in order to avoid theological censorship. Fracastoro had already discussed problems of celestial physics and the physical problems linked with mathematical modeling in relation to physical causation in an exchange with Gasparo Contarini which took place in 1531. In this exchange Contarini expressed his doubts over Fracastoro's lack of consideration of the Aristotelian viewpoints on heavenly souls and intelligences. Fracastoro offered a full account of cosmic animation in his later dialogue 'on the soul' by taking a different path than his Paduan teachers and philosophical interlocutors. He picked up the Platonic idea of the world soul, which animates the whole, and freely connected it with Aristotelian views about the ensouled cosmos of concentric spheres. Thus, his cosmology resulted from an eclectic composition of Platonic, Aristotelian and Averroistic elements. He aimed to create a renewed mathematical astronomy that would explain planetary motions as the result of the movements of concentric spheres. Fracastoro grounded this renewed astronomy on an understanding of the cosmos as a living whole. Such an animated homocentric cosmos represented, at the same time, both a development based on Aristotelian premises and a step beyond this legacy.

Medieval and Renaissance philosophers held intense debates over whether heavenly souls can legitimately count as the causes of the motions of heavenly bodies. In particular, they discussed whether the rotation of the heavenly spheres (or ‘orbs’, which are the carriers of the planets and the fixed stars around the cosmic center) was caused by a ‘form’, or soul. The historian of premodern cosmology, Edward Grant, asserted that Latin Scholastics generally embraced a de-animated conception of the cosmos. However, he also pointed out significant exceptions to this rule, the most important of which were Thomas Aquinas and Robert Grosseteste. In fact, both philosophers remained open to the soul theory of heavenly motion.<sup>1</sup> During the Italian Renaissance, the idea that the cosmos is animated became ubiquitous. Writers like Francesco Patrizi, Giordano Bruno, and Johannes Kepler, who read Plato’s *Timaeus* or who revived Stoic visions of planets as being like fish or birds in the air, warmheartedly embraced this idea.<sup>2</sup> In addition, the vision of an animated cosmos deeply affected various strands of Aristotelian philosophy, including those active in university teaching. The University of Padua in the sixteenth century is an instance where an animated cosmology circulated within an Aristotelian mode of thought.

In this article, I consider the living cosmos of concentric spheres by a prominent philosopher and physician of the Padua School, Gerolamo Fracastoro (ca. 1476–1553).<sup>3</sup> Fracastoro is best known in the history of astronomy for his *Homocentricorum, sive de stellis, liber unus* [One book Concerning Homocentrics, or, on the Stars] (Venice, 1538). This work attempted to construct a physically sound mathematical theory of planetary motions, which renounced the main Ptolemaic geometrical devices, that is, epicycles, eccentrics, and deferents. Such a project appears to be in line with Aristotle’s Eudoxian agenda in *Metaphysics* XII (the classical reference source of an astronomy of concentric spheres), which found its medieval roots in two Andalusian authors as different as Averroes (Ibn Rushd) and Alpetragius (al-Bīṭrūjī).<sup>4</sup> Although *Homocentrica* could have derived its legitimation from that tradition,<sup>5</sup> I argue that Fracastoro actually justified it through a doctrine of universal

---

<sup>1</sup> Edward Grant, *Planets, Stars and Orbs: The Medieval Cosmos, 1200–1687* (Cambridge: Cambridge University Press, 1994), 472.

<sup>2</sup> The cometary debates of Tycho Brahe’s time provided a great impulse for speculations about the possible causes of planetary motions through a fluid space, including forms of ‘astrobiology’, as Paolo Rossi has labelled them. See, among others, Paolo Rossi, “La Negazione Delle Sfere e l’astrobiologia Di Francesco Patrizi,” in *Il Rinascimento Nelle Corti Padane: Società e Cultura* (Bari: De Donato, 1977), 401–39; Miguel Ángel Granada, “A quo moventur planetae?: Kepler et la question de l’agent du mouvement planétaire après la disparition des orbes solides,” *Galilaean* 7 (2010): 111–41; Patrick J. Boner, *Kepler’s Cosmological Synthesis: Astrology, Mechanism and the Soul* (Leiden: Brill, 2013).

<sup>3</sup> The ‘School of Padua’ refers to exponents whose training and intellectual activity was closely linked to the curricular education of the University of Padua during the Renaissance, as a particular path to Aristotelian philosophy and Galenic medicine. Mario Di Bono regards Fracastoro, together with Alessandro Achillini, Giovan Battista Della Torre and Giovan Battista Amico, as an exponent of the Padua approach to astronomy. Cf. Mario Di Bono, *Le sfere omocentriche di Giovan Battista Amico nell’astronomia del Cinquecento* (Genova: Consiglio Nazionale delle Ricerche. Centro di Studio sulla storia della tecnica, 1991), esp. 62–71.

<sup>4</sup> On the convergence of their astronomical project, see Abdelhamid I. Sabra, “The Andalusian Revolt against Ptolemaic Astronomy: Averroes and al-Bīṭrūjī,” in *Optics, Astronomy and Logic: Studies in Arabic Science and Philosophy* (Aldershot, Hampshire: Variorum Reprints, 1984), 133–53. For a more nuanced technical inquiry into Islamic and Latin homocentric astronomy, cf. José Luis Mancha, *Studies in Medieval Astronomy and Optics* (Aldershot; Burlington, VT: Variorum, 2006).

<sup>5</sup> It should be noted that Fracastoro’s *Homocentrica* appeared in a context that is strongly marked by the two-pronged reception of Averroes and Alpetragius’s visions concerning an astronomy of concentric spheres. In the same year in which Fracastoro completed his mathematical-astronomical work, Alpetragius’ *Planetarum theórica physicis rationibus probata* [Planetary theory demonstrated by physical reasons] was printed in Venice (1531). The homocentric theory was received, expanded and inserted into an explicitly Peripatetic framework by another Padua-educated philosopher, Giovan Battista Amico. His *De motibus corporum coelestium iuxta principia peripatetica, sine eccentricis et epicyclis* [On the motion of the heavenly bodies according to peripatetic principles, without eccentrics and epicycles] (Venice 1537), of Averroistic inspiration, even preceded the publication of Fracastoro’s *Homocentrica*.

animation inspired by Plato, which he eclectically connected with natural ideas of Aristotelian, perhaps even Averroistic, origin. He specifically dealt with it in a posthumous dialogue on the immortality of the soul, *Fracastorius sive de anima* [Fracastorius, or the Soul] (1555). This work clearly shows that his philosophy, once it is contextualized within the Paduan school that he was a part of, clearly went beyond the Aristotelian doctrines on the cosmos. His Platonic bias gave a new twist to the integrated reading of cosmology, psychology, and metaphysics that was typical of the Averroist tradition.

## The Living Cosmos: A Medieval Legacy

As Grant has pointed out, heavenly animation was less readily accepted among Latin cosmologists than by those in the Islamic world. Many theologians feared that animated visions of the heavens could revive astral idolatry. This is why they preferred to posit angelic agents rather than souls at the source of heavenly motion, and identified them with the ‘separated movers’ postulated in *Metaphysics* XII.<sup>6</sup> Islamic philosophers had more freely inserted Plato’s views into the body of Aristotelian philosophy, including his views on cosmic life. Averroes, the Aristotelian commentator *par excellence*, assumed that the heavenly ‘spheres’ are endowed with souls, thus continuing a tradition in which Alfarabi (al Fārābī) and Avicenna (Ibn Sinā) are the most prominent authors of reference.<sup>7</sup>

Averroes argued for his position in various places, including in *De substantia orbis* [The substance of the sphere], which was translated into Latin in the thirteenth century and was used as a textbook for the teaching of natural philosophy at Italian universities during the Renaissance.<sup>8</sup> Although his views, rooted in Aristotelian exegesis, renounced the typically Platonic notion of the *anima mundi*, the ‘world soul’ that permeates all of reality, they disseminated an animated conception of the cosmos as the composition of *ensouled* bodies within a self-proclaimed Aristotelian tradition.<sup>9</sup>

Averroes and his followers conceived of the souls of heavenly bodies as ‘forms’ which cause the spheres to move. The origins of this idea can be traced back to antiquity. It was Alexander of Aphrodisias who first expounded the systematic connection between Aristotelian cosmology, psychology and metaphysics. In his *Mabādi’ al-kull*, a work ‘on the principles of all’ that has been preserved in its Arabic version, he laid the groundwork for animated cosmologies. He argued that there is a double source of causation in the motion of the heavenly spheres. One is the soul that

---

<sup>6</sup> Cf. Grant, *Planets, Stars and Orbs*, 526 and ff. In the early seventeenth century, a Paduan supporter of heavenly animation like Cesare Cremonini’s pupil, Giulio Cesare Lagalla, reacted to allegations of pagan idolatry for his viewpoints on the animation of the heavens in a controversy that took place in Rome around 1613. His most fierce opponent was the Jesuit Francesco Diotallevi, who denounced the dangerous dissemination of the “erroneous and heretical” doctrines of “Cremonini’s School.” Lagalla later reported on this controversy in Giulio Cesare Lagalla, *De coelo animato disputatio* ([Heidelberg]: Typis Voegelianis, 1622). Cf. Paolo Galluzzi, *The Lynx and the telescope: the parallel worlds of Cesi and Galileo*, 2017, 160–165.

<sup>7</sup> Cf. Herbert Alan Davidson, *Alfarabi, Avicenna and Averroes: Their Cosmologies, Theories of Active Intellect and Theories of the Human Intellect* (New York: Oxford University Press, 1992).

<sup>8</sup> The famous professor at Padua and Bologna, Pietro Pomponazzi, lectured on this book in his classes, for example, in 1507 at Padua, as is attested by the *Expositio libelli de substantia orbis* (Rome, Biblioteca Vat., Reg. Lat 1279, 3r-36v). See Pietro Pomponazzi, *Corsi inediti dell’insegnamento padovano*, ed. Antonino Poppi (Padova: Antenore, 1966). On his involvement in controversies over Averroes see, among others, Dag Nikolaus Hasse, *Success and Suppression: Arabic Sciences and Philosophy in the Renaissance* (Cambridge, MA: Harvard University Press, 2017), Chap. 5.

<sup>9</sup> The neo-Platonic element was very emphasized in the Islamic tradition that preceded Averroes, as well as in Renaissance philosophies after Marsilio Ficino’s revival of neo-Platonism. An overview of early-modern supporters of the animated cosmos can be found in Roberto Bondi, *Il primo dei moderni: filosofia e scienza in Bernardino Telesio* (Roma: Edizioni di storia e letteratura, 2018), 2–7.

internally moves the spheres owing to an inner desire that is directed toward the external object known as a ‘intelligence’. The intelligence constitutes the abstract object of the soul’s desire. As such, it is the final cause of heavenly motions. Alfarabi, Avicenna, Averroes, and their Latin followers embraced the theory that heavenly motions are the effect of the souls’ *intellectual* desire to realize the perfection proper to the ‘separated intelligences’. The number of these intelligences remained controversial, although it was often assumed that they equal the number of the heavenly spheres.<sup>10</sup> God was at the top of the cosmic hierarchy, and He ruled over the intellectual entities and the ensouled cosmos as the ‘Prime Mover’.<sup>11</sup>

Within the perspective of Aristotelian ensouled ‘celestial physics’, the heavenly spheres are not animated in an identical sense to the way that animals are, because while they have an intellect they have no senses. Thomas stressed the difference between the various ‘forms of life’ in the *Summa theologiae* (pt. 1, qu. 70, art. 3): “the heavenly bodies are not ‘living’ in the way planets and animals are, but in an equivocal sense. Thus, between those who hold that the heavenly bodies are alive and those who deny it, there is no real, but merely a verbal disagreement.”<sup>12</sup> Among Thomas’s sources—and the sources of his sources—Averroes emphasized the purely rational character of the desire that moves heavenly souls, drawing on Alexander’s emphatic distinction between heavenly and animal souls. As one reads in Alexander’s *Mabādi’ al-kull*, or *On the cosmos*, “the divine body cannot be affected, and appetite and passion are affections; this is why the souls of the divine bodies are not specifically the same as any of the souls that exist in material things.”<sup>13</sup> While inferior souls are moved by appetite, passions and will, the superior ones are only guided by intellectual desires due to their incorruptible nature.

In sixteenth-century Italy, the idea that heavenly motions had to be accounted for in terms of the action of souls was widely accepted. The most important exponents of the so-called ‘School of Padua’, including Pomponazzi, Zabarella and Cremonini, agreed on an animated version of the Aristotelian cosmos. Renaissance Scholastics emphasized the hierarchy of soul types. They thought that equivocation could be avoided by introducing specific differences, that is to say, if a term had more than one meaning, it was important to discuss the subtle differences of its semantic meaning. For example, Nifo defined the various degrees of ‘forms’, including souls, in the following sequence: The form of the elements is the lowest, as it cannot be separated from the matter nor operate without it, while the forms of the heavenly bodies are quite different. In *De intellectu* (II 22), Nifo called them “*animae animalium coelestium*,” that is the “souls of celestial animals.” They act upon the most noble natural entities without depending on them for their action. Human souls are located between the animal and the divine. They connect temporality and eternity and, although most of their operations are material and organic, they can transcend the contingent realm of ‘coming to be and passing away’.<sup>14</sup>

---

<sup>10</sup> Alfarabi, for instance, posited the existence of nine intelligences corresponding to the nine primary spheres, two for the daily rotation of the starry heaven and the precession of the equinoxes, and seven for the seven ‘planets’ which include the moon and the sun. Cf. Davidson, *Alfarabi, Avicenna and Averroes*, 45.

<sup>11</sup> On the connection of the psychological doctrine of the active intellect and the metaphysical doctrine of the Prime Mover, which was already outlined by Alexander, see Gad Freudenthal, “The Astrologization of the Aristotelian Cosmos: Celestial Influences on the Sublunar World in Aristotle, Alexander of Aphrodisias, and Averroes,” in *New Perspectives on Aristotle’s De Caelo* (Leiden: Brill, 2009), 239–82, 250.

<sup>12</sup> Quoted from Edward Grant, *Planets, Stars and Orbs*, 1994), 476. See also Pietro Daniel Omodeo, “Presence/Absence of Alexander of Aphrodisias in Renaissance Cosmo-Psychology,” in *Alexander of Aphrodisias in the Middle Ages and the Renaissance*, ed. Pietro B. Rossi, Matteo Di Giovanni, and Andrea A. Robiglio, *Studia Artistarum* (Brepols, in press).

<sup>13</sup> Alexander of Aphrodisias, *On the cosmos*, ed. Charles Genequand (Leiden: Brill, 2001), 49.

<sup>14</sup> Agostino Nifo and Leen Spruit, *De Intellectu* (Leiden: Brill, 2011), 304–305.

The theory of the heavens' souls became a crucial theme in the framework of the Alexandrist-Averroist controversy over the immortality of the soul, where the most prominent antagonists were Agostino Nifo and Pietro Pomponazzi. Nifo thought that the heavens are evidence that the soul can act independently of the body. He argued that the souls of the heavens act independently of the spheres they move and the separate intelligences of the heavens subsist independently of matter. In a similar manner, human souls can act and subsist independently of their bodies. In Nifo's view, this consideration undermined Pomponazzi's main argument for the mortality of the soul.<sup>15</sup>

According to Pomponazzi—who appealed to 'reason', by which he meant Aristotelian philosophy—the human soul cannot operate without the body because its main activity, cognition, depends on the senses and the imagination. These two psychological faculties are indissolubly bound to the body. Since the soul cannot accomplish any functions when it is separated from the body, it must die when the organism does. Nifo objected to this in *De immortalitate animae* [On the immortality of the soul] (1518), in chapter 61:

[...] let us now deal with Pomponazzi's arguments. Firstly, he argues in this way: the soul is an act of the body, thus it depends on the body to accomplish its functions. Consequently, above all, his reasoning is not valid, since any soul of the heavens is an act of the heavens, although in thought it does not depend on the heavens either as a subject or as an object.<sup>16</sup>

In order to refute Nifo's criticism, Pomponazzi denied the possibility of identifying heavenly intelligences and heavenly souls and he also denied that the immortality of *human* souls can be inferred from the *separability* of heavenly ones. He emphasized the distinctions between the various kinds of souls. According to him, it is improper to speak of animal souls with reference to heavenly and human beings. The spheres are ensouled entities but not animals. He writes,

Thus, the heavenly bodies, men and the beasts are not animated beings in the same unique sense since, as we have seen, their souls are not an act of the organic physical body in the same unique sense. Therefore, in his *Paraphrasis de anima*, Alexander stated that we call the Intelligence 'soul of the heavens' and the heavens 'animal' in a rather improper sense; Averroes seems to be of the same opinion in his book *De substantia orbis*. Instead, we call the beasts 'animal' in the proper sense, as is clear from common linguistic use. We call men 'animal' in an intermediate sense.<sup>17</sup>

---

<sup>15</sup> Eugenio Garin pointed out the relevance of cosmology in the controversy on the immortality of the soul in Eugenio Garin, *Storia della filosofia italiana*, 3 vols. (Torino: Einaudi, 1967), vol. 2, 526–527.

<sup>16</sup> Cf. Agostino Nifo, *L'immortalità dell'anima contro Pomponazzi*, ed. José Manuel García Valverde and Francesco Paolo Raimondi (Savigliano, Cuneo: Aragno, 2009), 272–274. “[...] nunc ad rationes Pomponatii accedamus. Argumentatur igitur primo: anima est actus corporis, ergo in operando dependet a corpore. Ubi patet primo eius argumentum non valere, quandoquidem quaelibet caeli anima est actus caeli, quae tamen in intelligendo a caelo non dependet, nec ut a subiecto, nec ut a obiecto.” This specific English translation is based on the Italian one by Francesco Paolo Raimondi, 273–275. Throughout this essay I offer translations which are content-oriented rather than literal. The original text can be checked in the footnotes.

<sup>17</sup> Pietro Pomponazzi, *Tutti i trattati peripatetici* (Milano: Bompiani, 2013), 990. “Quapropter non uno modo corpora caelestia, homines et bestiae animalia sunt, cum non uno modo eorum animae sint actus corporis physici organici, ut visum est. Ideo Alexander in *Paraphrasi de anima* dixit Intelligentiam satis aequivoce dici animam caeli, et caelum animal. Cui et consentire videtur Averroes in *De substantia orbis*. Proprie vero bestiae animalia dicuntur, sicut est communis usus loquendi. Medio autem modo homines animalia nuncupata sunt.”

Pomponazzi's arguments and subtle distinctions were not able to persuade his adversaries, not even his pupil Gasparo Contarini, author of a *Tractatus contradictorius* [Opposing treatise]. Contarini rejected Pomponazzi's thesis that the soul dies with the body by also asserting, in line with Nifo, that Aristotle's and Averroes' intelligences are real forms—more precisely, souls—of heavenly bodies, and that they therefore provide proof that eternal and separable souls exist.<sup>18</sup> Without delving into the details of these much-studied polemics, here it is important to emphasize the interdependency of psychology and cosmology in the Italian philosophy of the *Cinquecento*, which constitutes the background of Fracastoro's work.

### **Fracastoro's Cosmic Animation<sup>19</sup>**

Fracastoro, who was another pupil of Pomponazzi's, believed in both the animation of the heavens and the immortality of the soul, but for different reasons than Contarini and most Aristotelians of his time. The main reference on this topic is not his work on mathematical astronomy, *Homocentricorum, sive de stellis, liber unus* (Venice, 1538), but rather his dialogue on the immortality of the soul, *Fracastorius, sive de Anima, dialogus* [Fracastoro's dialogue, or, on the Soul] (posthumous, 1555). A reassessment of the natural views present in this dialogue sheds new light on the physical foundations present in *Homocentrica*, as problems that emerged in that earlier book only found solutions in the later, posthumously-published dialogue.

*Fracastorius* is the third of a trilogy of dialogues, in which Fracastoro evoked—and probably idealized—the philosophical conversations he had had with his friends Andrea Navagero, Giangiacomo Bardulone and the brothers Giambattista and Raimondo Della Torre in the idyllic countryside of Verona. The triad of dialogues includes *Navagerius* (On Poetics), *Turrius* (On Intellection) and *Fracastorius* (On the Soul). All of the dialogues are dedicated to the man of letters, Giovanni Battista Ramusio, to whom Fracastoro mentioned the last dialogue on 10 May 1549 as “*de immortalitate animae*” [On the Immortality of the Soul].<sup>20</sup> In it, Fracastoro extensively deals with cosmology. This is no surprise, given his understanding of the heavens as ensouled and the fact that the souls of the heavens had been a heated topic in the Pomponazzian polemics on immortality of the first half of the sixteenth century.

Fracastoro, the *figura dialogans* whose views can be said to coincide with those of the author, states that the human soul cannot be understood without a clear comprehension of the souls that move the heavenly spheres and make them rotate with so much regularity.<sup>21</sup> Fracastoro introduces three

---

<sup>18</sup> Contarini's treatise initially circulated in manuscript form. His views can be found in his two books *De immortalitate animae*, the second of which followed Pomponazzi's response, in the *Apologia* (1518). See Gasparo Contarini, *Opera* (Parisii: Apud Sebastianum Nivellium, 1571), 177–232; Pietro Pomponazzi, “Apologia,” in *Tutti i trattati peripatetici*, 1107–1538.

<sup>19</sup> I prefer the expression ‘animation’ to ‘vitalism’, although the latter might also apply. I wish to avoid confusion among various meanings of this term in early modernity. Kevin Chang has distinguished between ‘cosmic vitalism’, referred to a vision of the cosmos as a living animal, and ‘immanent vitalism’, which refers to the emergence of life from organic bodies. However, only the former meaning is relevant in this context, since Fracastoro's emphasis is on the ‘soul’ of the heavens rather than their ‘life’, I prefer to speak of animation, following Charles Wolfe's warning against misunderstandings from the viewpoint of the history of biology. See Kevin Chang, “Alchemy as Studies of Life and Matter: Reconsidering the Place of Vitalism in Early Modern Chemistry,” *Isis* 102, no. 2 (2011): 322–329; Charles T. Wolfe, *La philosophie de la biologie avant la biologie: une histoire du vitalisme* (Paris: Garnier, 2019).

<sup>20</sup> Cf. Enrico Peruzzi, “Introduzione” to Girolamo Fracastoro, *L'anima*, ed. Enrico Peruzzi (Firenze: Le Lettere, 1999), 11–71, 13.

<sup>21</sup> Girolamo Fracastoro, *Fracastorius sive de anima*, in id., *Opera Omnia* (Venetiis: apud Iuntas, 1574), 149r–161v, 150v.

degrees of souls, which, perhaps surprisingly for an Aristotelian reader, do not coincide with the standard Scholastic distinction between the souls of animals, humans and heavenly bodies. The three levels are now the *anima mundi*, the souls of the spheres and, thirdly, plants and animals.

There are three genres of organic bodies. The first one is the universe itself, which we call world; the second is referred to as the heavenly spheres; the third as plants and animals. It is evident from its parts that the world itself is a kind of organic body [...]. Hence, this universe looks like the most perfect animal; it lives and is ruled and moved by its soul, as all of our predecessors asserted. Theologizing academicians [the Platonists] have passed on to us many doctrines of the world soul [...].

That the heavenly spheres are certain types of organic bodies, as well, is evident because they are composed of dissimilar parts, some of which are denser, others rarer, and differ in magnitude, order and place, but with so much harmony, as they are directed to certain goals and operations, with amazing virtue, so that all bodies of the universe are ruled from there. That which moves and rules those spheres is their own soul, which the philosophers call 'intelligence' and 'mind'. However, that mind is not the soul of the world, but a particular nature, which receives being and virtue from the soul of the world and operates according to that received virtue.<sup>22</sup>

According to Fracastoro, the human soul finds its place in-between the different realms.

Fracastoro takes his definition of the soul from Aristotle. It is "the act of an organic body which has the potentiality of life."<sup>23</sup> He stresses the priority of the spiritual over the material, and emphasizes the function of the soul to impart force (*vis*) and motion (*agitation*) to the body. Motions are of two kinds. First, the motion of corruptible things, which is produced by an external cause and has the tendency to cease. Rest coincides with the death of the corruptible being. Secondly, there is a motion that is *per se* and does not tend towards rest. This is the motion of the incorruptible beings for which motion is an aim in itself. This applies to the most perfect bodies of the heavenly spheres and also to 'spirituality', which is understood as a longing for the divine. The most noble part of the human soul, the intellect, is living thought. Its incessant motion is akin to that of the heavens.<sup>24</sup>

Fracastoro also confronts Pomponazzi's arguments for the soul's mortality. Whereas his master rejected the analogy between the heavens and human beings, Fracastoro explicitly embraces the idea that the human intellect, just like the intellects of the heavens, can act without the body. Fracastoro argued that our spiritual activity can do without the senses and the imagination, and that therefore the soul can operate independently of the body. The possible separation of the soul (as an

---

<sup>22</sup> *Ibid.*, 149v-150r.: "Tria autem corporum organicorum videntur genera. Primum est universum ipsum, quem mundum dicimus: aliud vero coelestes orbis; tertium plantae, et animalia. Quod enim mundus ipse organicum quoddam corpus existat, manifestum est ex eius partibus [...]. Quare et hoc universum, tanquam animal quoddam perfectissimum, vivere, et anima sua regi, atque agitari maiores nostri omnes fere dixere: ac multa quidem de mundi anima theologizantes academici tradidere. [...] quod vero et coelestes orbis organica quoque sint corpora, manifestum est, quoniam idipsa dissimilaribus constant partibus, aliis quidem densioribus, aliis rarioribus, et magnitudine, et ordine, et situ differentibus: vero consensu tanto, tam mira virtute ad certos fines, et operationes constitutis, ut omnia, quae in universo sunt, corpora inde gubernentur. Quae vero eos orbis agitat, et regit, Anima ipsorum est, quam Philosophi intelligentiam et mentem vocant. Non est autem haec mens, mundi anima, sed particularis quaedam natura, quae et esse, et virtutem recipit a mundi anima, operatur autem secundum illam, quam recepit, virtutem."

<sup>23</sup> *Ibid.*, 150v: "Quapropter maxime laudandus est Aristoteles, qui animam dixit esse actum corporis physici, organici, potentis vivere."

<sup>24</sup> *Ibid.*, 155r.

intellectual soul) from the body after death implies that an epistemic leap beyond the limitation of thought through senses and images (*rerum simulachra et species*) is possible. Fracastoro believed that, after the death, our intellects receives the grace to know God without any corporeal mediation.<sup>25</sup> Moreover, the connection of the individual soul with the “golden chain” (*aurea catena*) of the *anima mundi* is not dissolved through the death of the body.<sup>26</sup>

Fracastoro also addresses another argument of Pomponazzi’s, which the latter derived from Aristotle’s *De coelo*. According to it, all that is generated must perish (*De coelo* I 12, 282a 1–4). Pomponazzi inferred from this that the human soul is destined to pass away just as it came into being.<sup>27</sup> By contrast, Fracastoro appeals to a superior principle, according to which God can create immortal souls.<sup>28</sup>

### Fracastoro’s Cosmogony

Influenced by Plato’s *Timaeus*, Fracastoro’s philosophy has a clear theologizing tendency that also led him to draft a speculative cosmogony in which the Demiurge is replaced with the Christian God. In the last part of his dialogue on the soul, he presents an original account of the creation of the world meant to demonstrate that all of nature has been realized for the sake of man and in order to be *contemplated and known* by our intellects. This section is absent from early-modern printed editions. It must have looked ‘too daring’ in an age of heated theological and confessional struggles, and therefore, in my opinion, the editors of Fracastoro’s posthumous *opera* must have omitted it. Fracastoro himself introduced his cosmogony as a step beyond natural philosophy:

Della Torre, you push me beyond what I have promised. In fact, we did not come here to address issues that are better suited to religious people. However, I will not desist from this effort, if you wish me to report what I heard from them.<sup>29</sup>

In Fracastoro’s version of the demiurgic myth, the divine architect (*opifex maximus*) created the world beginning with a point from which He traced a line, and then constructed a circle and the all-encompassing sphere. This circle was then separated into two disproportionate realms, the heavens and the sublunary realm, the former of which was constructed according to a complex system of visible and invisible spheres:

When God created this universe which we call world, he first looked at the middle and marked a point there that was to be the center of the whole. From that point, he drew a line through the immensity and ended it in another point. Then, he drew another line, equidistant from the

---

<sup>25</sup> *Ibid.*, 160r.

<sup>26</sup> *Ibid.*, 158r.

<sup>27</sup> Pomponazzi, *Trattato sull’immortalità dell’anima*, in id., *Tutti i trattati peripatetici*, 4.

<sup>28</sup> Fracastoro, *Fracastorius sive de anima*, 159r.

<sup>29</sup> Id., *L’anima*, 170. “Extra promissa me rapis, Turri. Neque enim isthuc venimus ut haec requireremus, quae magis ad sanctos viros pertinere videntur. Si tamen placet ut referam et ipse quaedam quae ab ipsis audivi, equidem neque hunc laborem effugiam.” The manuscript of Fracastoro’s cosmogony, the last part of his dialogue on the soul, was rediscovered in the twentieth century and the dialogue has been republished in its entirety in recent years. For Peruzzi’s Latin-Italian edition, see the reference above. See also Francesco Pellegrini, “L’inedito nel dialogo fracastoriano ‘Fracastorius sive de anima’: cod. CCXXXL-III. Bibl. Capit. di Verona,” *Studi storici veronesi* 1 (1947): 303–24.



center, that delimited the maximum circle in which the space of the entire universe was to be inscribed. After this was established, he separated the initial straight line and the entire space into two parts. The superior one was much larger than the other one, but the dimension of the region that was to be occupied by the heavenly bodies was unknown to man. There he drew 75 spheres, of which only eight are visible while the others can be known through the intellect rather than the senses.<sup>30</sup>

In this cosmogonic myth, the sublunary sphere was occupied by a kind of raw matter in which God had implanted two sets of opposing principles—warmth and coldness, humidity and dryness—regulated by the most basic law of sympathy and antipathy: the like attracts the like and repels its opposite. He generated out of these basic contrasting qualities the four Empedoclean elements (earth, water, air and fire), and subsequently all possible mixtures and composite materials. From these elements God created inanimate beings (stones, metals and gems), organic animated beings (plants and animals), and eventually the crown of creation, human beings, who are capable of comprehending the secrets of the universe with their minds.

Fracastoro's cosmogony and his doctrine of universal animation illuminates the philosophical foundations of his homocentric astronomy. The main inspiration for his viewpoints on the cosmos can already be seen in the relevance he ascribes to Plato's *Timaeus*. Plato is explicitly mentioned as the source of the original intuition regarding the *Homocentrica*, which Fracastoro which came to Fracastoro through his friend Della Torre. As one reads in the dedicatory letter to Pope Paul III,

It is reported that, when Hermes Trismegistus was dying, he asked his friends who were at his death bed to remember his teaching about the ship that perpetually ascends and descends in the middle of the ether. Similarly, he [Della Torre] spoke with us, his friends present at his death bed. Among many other issues, at a certain moment he said, looking at me: 'There is one last thing that I would request from you'. I invited him to speak and he said: 'Please, remember those circles that Timaeus first intersects like the letter X and immediately twists so that the ends of the lines [of the X] become conjoined.' He clearly referred to the motions that he [Della Torre] invented. 'As I am going to die soon, I would be very reassured if I can hope that you will engage [with this issue] and bring my program to its completion'.<sup>31</sup>

The reference to *Timaeus* (36b-c) indicates that the Platonic component was part of Fracastoro's cosmology from its inception even though this aspect was only fully articulated in his

---

<sup>30</sup> Fracastoro, *L'anima*, 174. "Igitur universum hoc, quem mundum dicimus, quum esset Deus maximus conditurus, oculos primum in medium iecit, punctumque illic signavit, ubi centrum totius futurum esset. Tum ab eo puncto lineam rectam producens, in immensum valde protraxit puntoque alio terminavit; a quo rursum et aliam lineam ducens, undique a centro aequae distantem, circulum maximum descripsit, in quo spatium omne universi concluderetur. Haec quum statuisset, priorem rectam lineam et spatium totum in duas regiones discrevit, quarum superior longe maior altera esset, excessus vero illius homini non esset notus, in quo coelestia locum errant habitura. Atque in illa orbes 75 designavit, quorum 8 tantum sensu perceptibiles fuere, reliqui vero intellectione magis quam sensu noti."

<sup>31</sup> *Id.*, *Homocentrica*, in Girolamo Fracastoro, *Opera Omnia* (Venetiis: apud Iuntas, 1574), 1v. "Moriturus autem quum iam esset, (qualem Trimegistum Mercurium ferunt morientem astantes amicos rogasse, ut memores forent illius navis quam in medio aethere perpetuo ascendere, et descendere docuisset) ita ille ad nos conversus, qui astabamus amici quum multa alia dixisset, tum me respiciens, quiddam, inquit, habeo te Fracastori, quod te supremum rogem. Hortante vero me ut dicere, memorem inquit te fore velim eorum circularum, quos Timaeus ad figuram X litterae primum secat, mox ita retorquet, ut linearum capita inter se coeant (Significabat autem a se inventos motus) tum, quod mihi nunc invidet mors, si te praestaturum sperem, acceptum per me negotium perfecturum, magna morienti mihi consolatio futura est." On the Hermetic theme, see Enrico Peruzzi, *La nave di Ermete: La cosmologia di Girolamo Fracastoro* (Firenze: Olschki, 1995).

later work. The philosophical foundations of Fracastoro's cosmology also marks the difference between his homocentrism and other similar astronomical endeavors. While he was completing his work on homocentric heavenly spheres, the 'Padua-trained' philosopher Giovan Battista Amico published *De motibus corporum coelestium iuxta principia peripatetica, sine eccentricis et epicyclis* [On the motion of the heavenly bodies according to peripatetic principles, without eccentrics and epicycles] (Venice 1537). The similarity of Amico's and Fracastoro's reforms for astronomy is only superficial: although the idea of a cosmos of concentric spheres was dear to Averroistic Aristotelianism, it did not necessarily descend from that philosophical lineage, as Fracastoro's eclecticism shows, in particular his references to Plato.<sup>32</sup>

### Contarini's Exchange with Fracastoro on the Foundations of Homocentric Astronomy

Fracastoro's animated cosmology had a difficult relation to the Aristotelian tradition, as we can see from an exchange between Fracastoro and Contarini. Their very brief correspondence took place in 1531, much earlier than the effective publication of *Homocentrica*. It consists of two letters, which were to be included in Contarini's *opera omnia*. Contarini's first letter raises a series of doubts and objections. Fracastoro's reply is the second letter.<sup>33</sup>

Contarini read the homocentric treatise of his friend while he was on vacation in the countryside during a break from his political duties as a member of one of the most important Venetian magistracies, the College of Ten (*Collegium decem virum*). He had received the text from a common friend, the erudite Giovanni Battista Ramusio (*nostrum amatissimum, tuique in primis studiosus*). Contarini sketches out his circle of intellectuals and friends at the beginning of the letter. Besides Ramusio, it also includes "*Turrius noster summo ingenio*," who can be identified with the friar Giovanni Battista della Torre of Verona. Fracastoro dedicated several of his poems to Della Torre and even entitled his dialogue on intellection *Turrius*.<sup>34</sup> Contarini mentions him as the inspiration for Fracastoro's astronomy, which Fracastoro confirmed in the dedicatory epistle of the *Homocentrica* to Pope Paul III.<sup>35</sup> Their intellectual circle further comprised the theologian Marco Antonio Flaminio, whom Contarini mentions in his letter to Fracastoro as an intellectual companion with whom he spent his vacations in the countryside.<sup>36</sup>

In his letter, Contarini writes of his doubts concerning Fracastoro's models and their physical tenability. He asks questions concerning planetary distances, the apparent size of the heavenly bodies, details of the solar theory, and the relation between mathematical certainty and physical

<sup>32</sup> D'Amico's strictly Aristotelian program is clear from the outset of his *De motibus corporum coelestium*. See Di Bono, *Le sfere omocentriche di Giovan Battista Amico*, 5.

<sup>33</sup> I quote these letters from Contarini, *Opera*, "De homocentricis," 238–252.

<sup>34</sup> Fracastoro, *Carminum liber unus*, in *Opera omnia*, 199r–213v. See also, *Turrius sive intellectione dialogus*, in *ibid.*, 121r–148v. On the debates on heavenly harmony surrounding Fracastoro and Della Torre's work, see Jacomien Prins, *Echoes of an Invisible World: Marsilio Ficino and Francesco Patrizi on Cosmic Order and Music Theory* (Leiden; Brill, 2015), 264.

<sup>35</sup> Fracastoro, *Homocentricorum sive de Stellis, liber unus*, in *Opera omnia*, 1r–48v, 1v. Fracastoro also specifies that on his death bed Della Torre prompted him to accomplish the reform of astronomy he had envisaged but could not carry out. In addition, see the reference to Della Torre as the initiator of his work in the poem that concludes the book (48v). On the dedicatory letter and its context, see Miguel Ángel Granada and Dario Tessicini, "Copernicus and Fracastoro: The Dedicatory Letters to Pope Paul III, the History of Astronomy, and the Quest for Patronage," *Studies in History and Philosophy of Science* 36 (2005): 431–76.

<sup>36</sup> Flaminio also appears as one of the addressees of Fracastoro's poems. See Fracastoro, *Carminum liber unus*, 205v–206v.

approximation. Among these and other technical concerns, Contarini explicitly refers to the Scholastic account of animation in heavenly motions, which is in opposition to the account provided in Fracastoro's *Homocentrica*; Contarini believed that Fracastoro's account looked rather mechanistic.

In fact, *Homocentrica* only addressed the transmission of motion from the superior spheres to the lower ones in terms of efficient causation. Fracastoro based his account on a few schematic principles. His homocentric theory admitted no more and no fewer causes of motion than the number of spheres.<sup>37</sup> As to the *nature* of the movers, he remained undecided:

*Chap. 5: There is no sphere without one motion.*

[...] Thus, independently of whether a sphere is moved by itself or by some mind called intelligence, it is necessary that it be moved by one motion only, because it is one, unique natural principle of motion. As a matter of fact, nobody ever asserted that one sphere is moved by two intelligences.<sup>38</sup>

By contrast, Contarini derived from Averroes the idea that soul and intelligence can accurately explain heavenly motions in teleological terms. The spheres are moved by intellectual desire and not solely by efficient causes:

[...] there is no inconvenience that an inferior [sphere] is not transported by a superior. I would like to add some consideration concerning causes, precisely the final ones. As the Philosopher asserts in the second book of *De coelo*, heavenly bodies are not only moved by nature, but by the soul and the intelligence, which moves following a preconceived goal and [accomplishes] as many motions (each one accomplished by a specific sphere) as are needed to attain the pre-established goal. In my opinion what Averroes asserts in *Metaphysics* XII should be added, i.e., that the motion of every planet is like the motion of a particular art which follows the motion of the first mover as the principle of an art or of architecture. If one adds to your theses a consideration of the final cause, this can solve the doubts that your invention might raise; since it is not necessary that the superior transports the inferior [...].<sup>39</sup>

Fracastoro tackles the problem of finalism in nature in the conclusion of his replay to Contarini:

---

<sup>37</sup> Fracastoro explicitly gave a negative answer to the question of “whether several spheres can be guided by a common intelligence” (*utrum plures orbis ab a communi intelligentia duci possint*), in *Homocentricorum sive de Stellis, liber unus*, 4v.

<sup>38</sup> *Ibid.*, 4r. “Unum orbem non nisi unum motum habere. Cap. 5: [...] Sive igitur orbis a seipso moveatur, sive a mente aliqua et vocata intelligentia, uno tantummodo moveri necesse est, quoniam unum et naturae unius est principium, quod movet. A duabus enim intelligentiis unum orbem moveri nemo est, qui dixerit.”

<sup>39</sup> Contarini, *Opera*, 242–243. “[...] nihil obstat inferiorem [sphaeram] non vehi a superiori. Vellem itidem aliud addi, causae genus, finalis inquam, nam corpora coelestia, ut dicit philosophus in secundo *De Coelo*, non moventur a natura tantum, sed ab anima, et intellectu, qui movet secundum praeconceptum finem, totque motibus, et his motibus suum quaeque orbem citat, quot quibusque attingere queat finem praeconceptum. His addendum puto, id quod dicit Averrois in duodecimo *Metaphysicae*, quod scilicet motus uniuscuiusque planetae, est sicuti motus particularis artis quae deservit motui primi motoris tanquam principi arti, et architectonicae. Haec si quis supposuerit praeter ea, quae tu supponis ex causa finali, poterit solvere dubitationes, quae inventioni tuae officere possunt; quandoquidem non est necesse superiorem inferiorem vehere [...].”

You invite me to add two theses to my own in order to remove all difficulties: first, that it is not necessary that the superior sphere carries the inferior, in the cases in which it is not useful; and second, that the motions that are produced by their own intelligences are not only natural, but also depend on intelligence and will be directed to a preconceived goal. I will attentively consider these theses and would gladly embrace them if they were to contribute to solving [these] difficulties. However, I fear that they contradict the other [theses] and are not in harmony with them. After due consideration, we can talk about these and other issues, or I will write you my views.<sup>40</sup>

Although he showed respect towards his correspondent's views, Fracastoro did not concede that Averroist natural explanations of the heavens could support his astronomy. But for the time being he postponed the discussion of the psycho-physical problem of mathematical astronomy. The *Homocentrica*'s area of inquiry would be restricted to the description of the worldly machine on the basis of a few principles, among which was the proto-mechanistic principle according to which "the inferior [spheres] are transported by the motion of the superior spheres, but the superior receives nothing from the inferior."<sup>41</sup>

In particular, Contarini raised the question of the role of the intellect (and the soul) as the natural cause of the motion of heavenly bodies:

You affirm in the second thesis [of *Homocentrica*] that it is impossible that the same sphere is moved in itself by two intellects because the same simple body cannot have two natures. Beware that this argument will not look compelling to many. In fact, the inferior intelligences intellectually grasp the first [intelligence] through its essence, as it is in all of them as an intelligible form in the intelligent intelligence. Therefore, it seems convenient that the intelligence or soul of the first sphere, which is the form of the other inferior ones, moves the inferior spheres by itself. [This occurs] despite whether those motions are made directly by the first soul or by those proper to any spheres as they are informed by the first one. This is particularly the case with circular motions which, as the Philosopher asserts in the second book of *De Coelo* [On the Heavens], do not differ in kind but only in number.<sup>42</sup>

Contarini's remark on the physical problems of mathematical modeling arose out of the Paduan tradition of Aristotelian philosophy. He refers to Aristotle as "Philosophus," *the* Philosopher in the singular. In point of fact, his ensouled cosmology is particularly Averroist, and therefore he assumes

---

<sup>40</sup> *Ibid.*, 252. "Mones postremo suppositiones duas addendas esse nostris, quae si addite fuerint difficultates omnes tollant; quarum altera est, quod orbis superior, inferiorem vehat, non tamen necessario, sed possit et non vehere cum expedit; altera est, quod motus a propriis intellectibus non mere naturaliter fiat, sed per intellectum, et voluntatem prout praeconceptus exposcit finis. Quas suppositiones ego quidem diligentius considerabo: amplexendae enim quamlibetissime erunt si cunctas difficultates solvant, sed vereor ne prioribus contradicant, et cum iis non concordant; considerabimus tamen, et de hac re vel una alias loquemur, vel ad te scribam quid senserim."

<sup>41</sup> Fracastoro, *Opera omnia*, 4r: "Superiorum orbium motu agi et inferiores, ab inferioribus vero nihil superiores pati."

<sup>42</sup> Fracastoro in Contarini, *Opera*, 240: "Dicis in suppositione secunda, quod impossibile est eundem orbem moveri per se a duobus intellectibus, quia idem simplexque corpus duas naturas habere non potest. Vide ne haec ratio plurimis necessaria non appareat. Nam cum inferiores intellectus intelligant primum per essentiam primi, quae est in omnibus sicut forma intelligibilis in intellectu intelligente, nihil videtur officere, quin intellectus seu anima primi orbis, quae est forma aliarum inferiorum moveat per se inferiores orbis, sive is motus immediate fit a prima anima sive a propria cuiusque orbis pro ut formatur a prima, praesertim cum motus circulares, quamadmodum dicit Philosophus in secundo libro *de Coelo*, non differant in specie, sed tantum numero."

that a plurality of separate intelligences exists and that they are the causes of the motions of the heavenly spheres. Furthermore, he continues to identify heavenly intelligences and heavenly souls with each other (*intellectus seu anima primi orbis*), despite the criticism of his master Pomponazzi, or perhaps precisely as a reaction to his master's distinction, because it was seen as functional to the thesis of the mortal soul.

As it turns out, Fracastoro expounded upon the question of whether the cause of the sphere's motion is internal or external in his later work. In 1531, however, he limited himself to thanking Contarini for the suggestions, without adding any further details:

Your epistle led me to reconsider the booklet [*Homocentrica*]. I decided to erase many passages, introduce some additions, reorder some materials, and explain some issues better [...].<sup>43</sup>

### **On the Certainty of the Mathematical Modelling of the Heavens**

A fundamental question of astronomy and epistemology lies in the background of this exchange between Contarini and Fracastoro: that of the relation between phenomena, which can be modeled through mathematical means and explained through physical causes.<sup>44</sup> Here one can see that the classical topos of the relation between the *quia* and the *propter quid* of astronomy is connected with the Renaissance concern about the 'certainty of mathematics',<sup>45</sup> in particular the applicability of mathematics to natural philosophy (this in a time that precedes the seventeenth-century *physico-mathematics* of Benedetti, Galilei, Descartes and beyond).<sup>46</sup> In the exchange between Contarini and Fracastoro, the discussion of the relation between mathematics and physics takes the form of a discussion of how souls cause heavenly motions. Contarini introduces the physical problem of mathematical astronomy as follows:

You say that, according to nature, there are three circular motions [...]. Beware that somebody could accuse you of deriving physical conclusions from geometrical principles and of contradicting Aristotle and Plato, the most eminent philosophers. In fact, they teach us that many heavenly motions take place for the sake of generation and corruption of the lower beings. They mainly ascribe their [sublunary] vicissitude to the oblique motion [of the ecliptic], as can be seen in Aristotle's *On generation*, book 2 and Plato's *Timaeus*. The latter also ascribes it to the soul of the whole [the world-soul] alongside the determination, on the basis of harmonic numbers, of the figure of the Greek letter 'X', which was spherically twisted

---

<sup>43</sup> *Ibid.*, 252: "Fecit item epistula tua, ut libellum relegerim, et multa auferenda decreverim, nonnulla addenda iudicaverim, quaedam aliter ordinanda, alia melius declaranda [...]."

<sup>44</sup> Pierre Duhem, *Sozein ta phainomena: essai sur la notion de théorie physique de Platon à Galilée* (Paris: Hermann, 1908); Peter Barker and Bernard R. Goldstein, "Realism and Instrumentalism in Sixteenth Century Astronomy: A Reappraisal" 6, no. 3 (1998): 232–58; Pietro Daniel Omodeo, *Copernicus in the Cultural Debates of the Renaissance Reception, Legacy, Transformation* (Leiden: Brill, 2014), Chap. 5.

<sup>45</sup> Anna De Pace, *Le matematiche e il mondo: ricerche su un dibattito in Italia nella seconda metà del Cinquecento* (Milano: FrancoAngeli, 1993); Angela Axworthy, *Le mathématicien renaissant et son savoir: le statut des mathématiques selon Oronce Fine* (Paris: Garnier, 2016), Chap. 2.

<sup>46</sup> Cf. Ofer Gal and Raz Chen-Morris, *Baroque Science* (Chicago: The University of Chicago Press, 2014), 118–119; Pietro Daniel Omodeo and Jürgen Renn, *Science in Court Society: Giovan Battista Benedetti's "Diversarum Speculationum Mathematicarum et Physicarum Liber" (Turin, 1585)* (Berlin: Edition Open Access, 2019), Chap. 4.

to represent the two main motions, namely the daily and the oblique one of the Zodiac. If the sun and the other planets moved per se according to their nature, either along the celestial equator or another maximum circle, their motions would be very inconvenient for the process of generation and corruption. In fact, if its path were just along the celestial equator, the sun would not ascend and descend [during the year] and would always irradiate the same regions.<sup>47</sup>

The question concerns the ‘oblique’ motion of the wandering stars along the ecliptic which, according to Fracastoro, results from the composition of two motions. Contarini raises a question that points to a problem of both theory and authority. He thinks that it is incorrect to draw physical conclusions from mathematical presuppositions. Additionally, because Fracastoro’s geometrical modeling of the motions on the ecliptic and the celestial equator is a *three*-motion mechanism, it contradicts the main philosophers of antiquity who posited only *two* basic cosmic motions in classics such as *On generation and corruption* and *Timaeus*.

In response, Fracastoro argues that physics cannot undo the certainty of mathematical demonstrations, although nature does not always proceed mathematically:

As for the problem of deriving natural conclusions from mathematical principles I am well aware that mathematical and natural entities often diverge. For instance, although the contact of two circles occurs at a mathematical point, it is not necessarily the same in nature. However, in many cases [natural] consequences derive [from mathematical demonstrations]. For instance, as the circle is the figure with the greatest capacity, the body with the greatest capacity must also be circular. In the same manner, it seems to me that the properties and number of natural axes can be derived from the properties of intersecting lines owing to the similarity of their proportions. The same applies to the proposition that only three determined [lines] can exist, which intersect at right angles. This implies that there can exist only three determined and certain axes and, therefore, only three determined motions.<sup>48</sup>

Mathematical certainty has physical consequences. As for the respect due to the *auctoritates*, Fracastoro admonished his correspondent not to interpret Aristotle and Plato literally.<sup>49</sup>

---

<sup>47</sup> Contarini, *Opera*, 239: “Dicis item quod secundum naturam tres sunt motus circulares [...]. Vide ne nonnullis videaris uti principiis geometricis in demonstratione conclusionis Physices: simulque ne videaris contradicere Aristoteli et Platoni summis philosophis, qui cum doceant nos, plures motus coelestes esse ob generationem, et corruptionem horum inferiorum entium, praecipue tamen attribuunt vicissitudinem hanc motui huic obliquo, sic Aristoteles in secundo libro *de generatione*, et Plato in *Timeo*, qui etiam attribuit animae totius, postquam per numeros harmonicos eam distinxerat, figuram graecae literae X quae postea in orbem convoluta, duos hos motus nobis refert, diurnum inquam, et obliquum sub Zodiaco circulo: quod si Sol Planetaeque caeteri per se et secundum naturam moverentur, vel sub aequinoctiali circulo, vel sub utro volueris coluro, maxime certe incommodus esset motus ille vicissitudini huic generationis, et corruptionis: nam sub aequinoctiali si fuerit ad nullam inquam partium terrae accederet, nec ab ulla recederet Sol, verum eodem modo omnes semper respiceret [...].”

<sup>48</sup> *Ibid.*, 244: “Quod autem scribis videndum esse mihi ne ex principiis mathematicis putem naturalem conclusionem deducere, non certe me latet, saepe aliter se habere mathematica, aliter naturalia, neque enim si contactus duorum circulorum mathematicus in puncto fit, ita etiam et naturalis esse debet, at in multis tamen se consequuntur, ut si circulus capacissima figurarum, et corporum quoque capacissimum erit circulare, ita ex natura linearum, quae sese secant, videtur mihi, et natura, et numerus naturalium axium capi consimili ratione. Sicut enim illae tantum tres esse possunt, quae terminatae sint, illae scilicet quae sese ad rectos secant, ita et axes qui possunt esse terminati ac certi tres tantum sunt, quare et tres tantum motus determinati [...].”

<sup>49</sup> *Ibid.*, 246.

## Concluding Remarks

In summary, this essay is a contribution towards the reassessment of Fracastoro's philosophical originality by focusing on a neglected aspect of his eclectic vision of the world, namely the animistic foundation of his homocentric cosmology. His contemporaries admired his intellectual acumen. Among them, his friend Ramusio extolled his achievements in a dedication to the voluminous *Delle navigazioni et viaggi* [On navigations and travels] (1550), a collection of travel reports written around the globe. He entrusted his work to Fracastoro as one of the most excellent minds of the time, someone whose eclecticism went beyond bookish culture. Besides his achievements in medicine, Ramusio extolled his reform of astronomy based on new natural conceptions:

Your greatest achievement was to renew, in our time, the divine manner of writing on the sciences of the ancients. In doing so, you did not imitate, derive from some book, transcribe or clarify the ideas of others', as many do. Rather, you diligently considered [the problems] thanks to the subtlety of your intelligence [*ingegno*] and brought many novelties to the world, things unheard of which nobody even imagined before, for instance, new and certain heavenly motions and the subtle reasons of the homocentric [spheres]. In philosophy, you [unveiled] the secret manner to ignite our intelligence, and the thus-far unknown way of seeking wonderful causes that were obscure in the past, such as the sympathy and antipathy of nature, which we can observe in many things [...].<sup>50</sup>

We are now in a better position to appreciate Fracastoro's project of a novel foundation of cosmology through an integration of concentric spheres' mathematical astronomy, consonant with the requests of Aristotelian (especially Averroistic) philosophy, and Platonic viewpoints on the world soul.

Fracastoro's cosmology resulted from an eclectic composition of various philosophical elements. He envisaged a renewed mathematical astronomy capable of accounting for planetary motions as the composition of concentric spheres' movements and grounded it on a conception of the cosmos as a living whole. His *Homocentrica* (first printed in 1538), on an astronomy of concentric spheres, was received and discussed by scholars who belonged to the cultural environment of the Padua School. Padua Aristotelians generally explained heavenly motions in physical terms as the effect of heavenly souls and intelligences. Since the time of the polemics on the immortality of the *human* soul, which was famously initiated by Pomponazzi, all psychological discussions—including those about *heavenly spheres'* souls—raised controversies. In the wake of these debates, Fracastoro discussed the foundations of his homocentric planetary theory in a work on the immortality of the soul, a dialogue entitled *Fracastorius, sive de anima* (1555). It also comprised a cosmogonic myth, which was not included in early-modern editions of the dialogues, in order to avoid theological censorship. Fracastoro had already discussed problems of celestial physics and the status of

---

<sup>50</sup> Giovanni Battista Ramusio, *Primo volume: delle navigazioni et viaggi* (In Venetia: Appresso gli heredi di Lucantonio Giunti, 1550), \*iir-v. “[...] conciosia cosa che l’Eccel. Vostra sia stata quella, che sola a tempi nostri habbia rinovato il divino modo dello scrivere gli antichi circa le scientie, non imitando, o da libro a libro mutando, e trascrivendo, o dechiarando (come molti fanno) le cose d’altri; ma più tosto con la sottilità dell’ingegno suo diligentemente considerando, habbia recato al mondo molte cose nuove, prima non udite, ne punto d’altrui imagnate, come nell’astronomia alcuni nuovi, et certissimi moti de’ cieli, et de la sottilissima ragion degli omocentrici: In philosophia il secreto modo per lo qual si crea in noi la intelligenza, et la non conosciuta via di cercar le cause mirabili, ch’a tutti i passati secoli erano state occulte, come della concordia e discordia naturale, che in molte cose esser veggiamo [...]”

mathematical modeling in relation to physical causation in an exchange with Contarini that took place as early as 1531. Contarini expressed his doubts concerning the homocentric project for its lack of consideration of heavenly souls and intelligences. Fracastoro eventually offered his own account of cosmic animation in his later dialogue *On the Soul* by taking a different path than his Paduan teachers and philosophical addressees. In fact, he picked up the Platonic idea of the world soul animating nature and freely connected it with Aristotelian views about the ensouled cosmos of concentric spheres. At the same time, he eclectically connected Platonic vitalism with a sort of Christianized mathematical cosmogony and Scholastic views on the soul, matter and heavenly order. His animated homocentric cosmos was simultaneously both the development of the Aristotelian legacy and a step beyond it.

### Acknowledgements

For their support and suggestions, I am thankful to H Darrel Rutkin, Jacomien Prins, Lindsay Parkhowell, the editors of this special issue, Jonathan Regier, Charles Wolfe and Boris Demarest, as well as the blind referees.

I am thankful to the European Research Council for supporting this research, which is part of the *EarlyModernCosmology* endeavor (funded by the European Union's Horizon 2020 Research and Innovation Programme, GA n. 725883).