10 Philosophers' Reception of the Tychonic Cosmology

The mathematicians who taught at the Class on the Sphere were not the only scholars engaged in the cosmological debate at the College of Santo Antão. Alongside them, the professors of philosophy displayed a vivid interest in astronomical discussion. While teaching the fundamentals of Aristotelian cosmology and meteorology, they discussed the impact that the celestial novelties had on the traditional cosmos.

As elsewhere in the Jesuit colleges, the Lisbon philosophers' community echoed the ideas and debate developed among mathematicians.[1] Nevertheless, they were not passive readers of avant-garde mathematicians. On the contrary, philosophers debated and accommodated the notions that they considered to be more in tune with the Aristotelian framework.[2] Those ideas did not necessarily exclude a Tychonic conception of the universe. Conversely, the acceptance of notions such as the elemental nature of celestial matter, its fluidity and its corruptibility, which were developed within the context of the Tychonic discussion, led to an upgrade of the Aristotelian cosmological framework among the Portuguese Jesuits in the first half of the seventeenth century. Although they continued to regard themselves as the guardians of Aristotle's teachings, those philosophers elaborated a cosmological worldview that was entirely consistent with a Tychonic plan-

1 As Renée J. Raphael has shown, the Collegio Romano is probably the most notable example. Raphael, "Copernicanism in the Classroom".

2 There is abundant literature on the pluralism, diversity and dynamism that characterised early modern Aristotelianism. See, among others, Schmitt, *Aristotle and the Renaissance*; Des Chene, *Physiologia*; Ariew, *Descartes among the Scholastics*; Mercer, "The Vitality and Importance".

DOI 10.30687/978-886-969-661-9/010

etary rearrangement. Thus, while historians have tended to emphasise the existence within the Jesuit Order of strict disciplinary distinctions and different scholarly practices between mathematicians and philosophers, this chapter shows that there was no such clear divide.

Philosophers and mathematicians nevertheless operated in different disciplinary and institutional settings. In fact, philosophers were not supposed to discuss the planetary system – which was a task reserved for mathematicians – but instead were meant to analyse cosmological issues such as the nature of celestial matter. Because of that, the Santo Antão philosophers privileged the debate on comets and new stars over the other celestial novelties. Furthermore, unlike their mathematician counterparts, professors taught philosophy only transitorily at the College of Santo Antão. Usually, on completing the theological course, Jesuits were asked to teach philosophy before embarking on a theology teaching career, a government profession or missionary activities. Alongside the University of Évora, the College of Arts of the University of Coimbra and the College of Saint Paul in Braga, the College of Santo Antão was one of the institutions in Portugal where philosophy teaching took place for most of the seventeenth century. Accordingly, Santo Antão's philosophers usually taught this subject only once during their career, beginning with logic, proceeding with natural philosophy and finishing the three-year course with ethics and metaphysics. The philosophy professors thus formed a volatile community in Lisbon, even though they were deeply interested in the cosmological debate.[3]

The period spanning from the 1610s to the late 1630s was a critical one for this philosophical community as the recently observed comets and new stars seemed to jeopardise the foundations of their Aristotelian cosmology. In the late 1610s, despite mathematicians' argument that comets moved above the Moon, the Lisbon philosophers still argued in favour of the traditional view according to which comets were made up of exhalations that ascended from the Earth's surface to the upper region of air, where they deflagrated when coming into contact with fire. This was precisely the theory advocated in a philosophical course produced at the College of Santo Antão and published in 1618 under the title *Doctrina philosophica*.[4] According to this teacher of Santo Antão,

> Comets do not consist of celestial but sublunar matter. Their matter is the hot and dry, viscous and greasy terrestrial exhalations which, once in contact with the fire, last for some time according to the quality and quantity of the exhalations.[5]

3 In the period from the early 1610s until the late 1630s, when the cosmological debate was at its peak at the College of Santo Antão, the teaching of philosophy was assigned to the following professors: Luís Brandão, 1612-15; Baltazar do Amaral, 1615-18; Apolinário de Almeida, 1618-21; António Correia, 1621-22; Diogo Lopes, 1622-24?; Diogo Leitão, 1624-27; Francisco Rodrigues, 1627-30; Domingos Barbosa, 1630-33; António Bandeira, 1633-36, and Martim Leitão, 1636-39. ARSI, Lus. 39 and Lus. 44 II.

4 The *Doctrina Philosophica* was published under the authorship of Luís Dias Franco. Franco has been considered to be a pseudonym used by the Santo Antão philosopher Baltazar do Amaral since the seventeenth century. The Jesuit historian João Pereira Gomes, however, attributed the authorship of this work to Luís Dias Franco himself, a student who finished the philosophical course at the College of Santo Antão in 1615. On this issue, see Gomes, "Franco (Luís Dias)".

5 Franco, do Amaral, *Doctrina Philosophica*, 198: "Dicendum igitur est cum Philosopho lib. 1 huius operis c. 7 et aliis, cometas non constare materia caelesti, sed sublunari, et illorum

This notion that comets were transient phenomena produced in the Earth's atmosphere left intact the fundamental principle of medieval cosmology, according to which there was a strict distinction between celestial and terrestrial regions. Unlike the Earth and its atmosphere, the heavenly region was considered to be a perfect region. Therefore, no processes of substantial change occurred in the area where the heavenly bodies moved supposedly in perfect circles embedded in rigid orbs.

Nevertheless, once he arrived in Lisbon in the early 1620s, Johann Chrysostomus Gall made it public that he had observed one of the comets of 1618 moving across the celestial region. As already mentioned, the German Jesuit took part in the astronomical observations carried out at the University of Ingolstadt led by Johann Baptist Cysat, who unequivocally proved that the comet moved above Venus.[6] A few years later, Cristoforo Borri explicitly associated the celestial location of comets with the corruptibility of celestial matter. The ontological divide between celestial and terrestrial regions was therefore at stake.

At first, the Santo Antão philosophers reacted with scepticism to the celestial novelties publicised by foreign colleagues. Accordingly, Diogo Leitão and Francisco Rodrigues, who taught philosophy in the late 1620s, explicitly mentioned the new cometary observations carried out by their mathematician counterparts. Nevertheless, they disagreed with them.[7] Leitão and Rodrigues preferred to shelter themselves from any sort of cosmological debate by claiming that the observations needed further inspection.[8]

According to these philosophers, comets were nothing but meteorological phenomena that resulted from the ascension of terrestrial exhalations to the boundary with the 'region of fire'.[9] In this context, Rodrigues opposed, among others, the thesis that comets resulted from planetary conjunctions. This could not be the case, Rodrigues argued, because the appearance of comets rarely coincided with the occurrence of celestial conjunctions. Thus, he informed his philosophy students at the College of Santo Antão in 1629 that:

> Other authors have considered the comet to be the conjunction of the seven planets. However, this statement is false, first, because, even though these planets are far apart, comets often appear; second, because the planets always meet in the Zodiac, which is not the case with comets; third, because the conjunction of two planets occurs for a brief time and the comet lasts for a long time. Therefore, the comet cannot be the conjunction of the seven planets.[10]

materiam esse exhalationes terreas, calidas, et siccas, ac multum pingues et crassas, in quibus ignis semel accensus per aliquod tempus detinetur pro qualitate et quantitate exhalationum".

6 See ch. 3.

7 Leitão, *In Libros*, BA, cod. 50-III-11, f. 110*r*; Rodrigues, *Compendium*, BGUC, MS 2316, f. 4*r*.

8 See, for example, Leitão, *In Libros*, BA, cod. 50-III-11, f. 110*r*.

9 Leitão, *In Libros*, BA, cod. 50-III-11, f. 131*r*; Rodrigues, *Compendium*, BGUC, MS 2316, ff. 4*r*-4*v*.

10 Rodrigues, *Compendium*, BGUC, MS 2316, f. 4*r*: "Alii dixere cometam esse coniunctionem 7 planetarum, haec tamen sententia falsa est. 1º quia quanquam istae planetae sunt disiunctae cometae videntur saepe saepit [?]. 2º quia planetae semper sunt in zodiaco cometae vero non ita. 3º quia coniunctio unaquaeque[?] planetae cum alio brevi tempore durat, cometa vero longo tempore perseverat; ergo cometa non potest esse coniunctio 7 planetarum".

Rodrigues finished teaching his philosophical course in 1630. With the new decade, a new philosophy professor, Domingos Barbosa, came forward. As far as comets were concerned, Barbosa shared the view of his predecessor that they were made up of "a great number of exhalations that are viscous and greasy and well compacted among themselves which is inflamed by fire".[11] However, Barbosa made a new point. According to him, recent astronomers had demonstrated that some comets actually rose above the heavens of the Moon, Mercury, Venus and the Sun.[12] Thus, despite consisting of exhalations, comets could, in some circumstances, ascend to the heavenly region. This very same view was corroborated by Barbosa's successor in the Santo Antão philosophical chair, António Bandeira.[13]

The celestial location of comets raised several issues for the traditional cosmological model. Among these, the ascension of comets through the heavens questioned the existence of a succession of solid orbs within which the planets and fixed stars moved; the rise of obnoxious matter, like terrestrial exhalations, into the heavens, a supposedly perfect and immutable zone, also raised doubts about the principle of celestial incorruptibility.

For the first question, having recognised that comets could ascend to the celestial region, Barbosa and Bandeira discarded the traditional notion that the heavenly region was divided into several rigid orbs. For both the philosophers, the upward and downward movement of comets throughout the celestial region and the planets' orbits required the heavens to be fluid.[14]

Like their fellow mathematicians, Barbosa and Bandeira adhered to a tripartite division of the universe, though with some particularities. They argued that the heavens should be divided according to the matter that composed them, distinguishing between the *caelum aereum* and the *caelum igneum*, to which they added the *caelum empyreum*. The *caelum aereum* was basically made up of air and corresponded to the region that extended from the Earth's surface to the 'heaven' of Venus, whereas the *caelum igneum* comprised the region from the Sun up to the fixed stars, where fire was the predominant element.[15] As the Moon and the other planets were not embedded in solid and rigid orbs but wandered in an airy or fiery environment, there was room for the terrestrial exhalations to ascend over the Moon's region.

As for the question of celestial incorruptibility, despite asserting that the heavens were composed of air or fire and acknowledging that comets could ascend to heaven, Barbosa and Bandeira still maintained the principle that no substantial change took place in the celestial region. According to them, the heavens and the terrestrial region were both made up of elemental matter;[16] however, an external agency prevented the celestial bodies from suffering any process of coming to be and passing away.[17] Using the scholastic theory of hylomorphism, Barbosa and Bandeira advocated the idea that the heavens were composed of matter and form, but, unlike what

11 Barbosa, *Philosophia*, BGUC, MS 2368, f. 80*v*: "Cometa est multitudo exhalationum pinguum et crassarum et bene cohaerentatarum[?] quae igne accendurri".

12 Barbosa, *Philosophia*, BGUC, MS 2368, f. 80*v*.

13 Bandeira, *Recopilatio*, BGUC, MS 100, ff. 86*r*-86*v*.

14 Barbosa, *Philosophia*, BGUC, MS 2368, f. 65*r*; Bandeira, *Recopilatio*, BGUC, MS 100, f. 68*v*.

15 Barbosa, *Philosophia*, BGUC, MS 2368, f. 70*v*; Bandeira, *Recopilatio*, BGUC, MS 100, f. 70*v*.

16 Barbosa, *Philosophia*, BGUC, MS 2368, f. 65*r*; Bandeira, *Recopilatio*, BGUC, MS 100, f. 68*v*.

17 Barbosa, *Philosophia*, BGUC, MS 2368, f. 66*r*.

happened with terrestrial bodies, for which there was a constant substantial change, in the celestial bodies, matter and form were, by divine will, in an inseparable state. Therefore, there was no privation and hence no substantial change.[18] That is to say, even if they were provided with the conditions responsible for the change (i.e. being composed of form and matter), these conditions were not operative for an external reason. In other words, even though they were made up of corruptible matter, the heavenly bodies remained incorruptible and immutable *ab extrinseco*: "*caelos esse corruptibiles ab intrinseco et solum ab extrinseco esse incorruptibiles et indissolubiles*", Bandeira proclaimed.[19]

By arguing in favour of celestial incorruptibility, Barbosa and Bandeira disagreed with their fellow mathematicians and particularly with Borri and his followers in the Class on the Sphere. Thus, Jesuit philosophers were not only aware of the new theories advocated by their mathematical confrères but also read them critically. As a result, they accepted some theories, even though they elaborated them differently; they rejected others that seemed contrary to the core aspects of Aristotelianism; and, above all, they developed a new theoretical framework that eventually allowed them to integrate these new theories.

The notion of celestial incorruptibility offers a case in point. Based on the ontological divide that structured the Aristotelian cosmology, the philosophers who taught at the College of Santo Antão were much more reluctant to recognise the existence of a substantial change in the heavenly region than to acknowledge, for example, the celestial fluidity. Nevertheless, they eventually accepted it. This was the case of Bento Rodrigues, who taught philosophy at the Lisbon College in the early 1660s. As he put it:

> It is proved, in the first place, by the observation of new heavenly bodies (that is, the 'new star' discovered in Cassiopeia) and of comets, which modern and most learned mathematicians, on Tycho's commission, have recognised to be newly generated. It is proved, in the second place, because various changes are observed every day on the Moon, and the same happens on other planets and on the Sun, where diverse spots are now seen and observed by mathematicians, which were previously undiscovered. These phenomena occur only because new generations took place on the Sun's surface, as the mathematicians themselves testify.[20]

Bento Rodrigues was in tune with the great majority of the Portuguese Jesuit philosophers, who, in the second half of the seventeenth century, acknowledged the corruptibility of the heavens based on astronomers' observations. Among these, Cristoforo Borri deserves a prominent place as he was commonly quoted in Portuguese philosophical textbooks.[21] A few years

18 Barbosa, *Philosophia*, BGUC, MS 2368, ff. 5, 65-6.

19 Bandeira, *Recopilatio*, BGUC, MS 100, f. 68*v*.

20 Rodrigues, *Philosophia naturalis*, BNP, cod. 4838, 5: "Probatur 1º ex observatione novorum syderum (et talis communiter dicitur nova stella in Cassiopeia inventa) et cometarum, quae de novo genita deprehenderunt novi et doctissimi mathematici a Tychone allegati. Probatur 2º quia in luna quotidie conservantur [sic, observantur] variae mutationes, idemque est in aliis planetis et in sole videntur modo et observantur a mathematicis quaedam maculae, quae antea non videnbantur, sed hoc sol a nova ibi generatione data poterat provenire, ut ipsi testantur".

21 See Carolino, "Cristoforo Borri".

later, another professor from Santo Antão was equally explicit in defending the theories of celestial fluidity and corruptibility based on astronomical observations. This was Manuel Veloso, who taught at the Lisbon College in 1668, after a sojourn in Rome, where he met the Jesuit mathematician Athanasius Kircher, the famous mathematics professor at the Collegio Romano by that time.[22]

Nevertheless, just like their colleagues in the early 1630s, Bento Rodrigues and Manuel Veloso had a critical understanding of the scientific contributions of their mathematician confrères. They discussed the cosmological consequences of the *new astronomy* (*nova astronomia*), as they called it, but had their own views on the subject. Thus, for example, both Rodrigues and Veloso argued in favour of a tripartite division of the cosmos, but, while Rodrigues maintained that the universe was divided into *caelum aethereum*, *coelum stellatum* and *coelum empyreum*,[23] Veloso considered, along the lines of Borri's *Collecta astronomica*, that the *coelum aereum* was followed by the *coelum sydereum* and the *coelum empyreum*.[24] These two philosophy professors also advocated, like Borri and the mathematicians of the Class on the Sphere, the principle of celestial fluidity, but, even so, Rodrigues distinguished the heavens of the planets from that of the fixed stars and restricted fluidity to the planetary heaven. He argued against Borri and Stafford – and in line with Fallon – that the heaven of the fixed stars was a solid body.[25]

Veloso, in his turn, while corroborating Borri's thesis of the fluidity of the physical heavens, vehemently disagreed with Borri's and Fallon's understanding of the movement of the celestial bodies. He considered that celestial bodies' intrinsic virtue moved planets and stars.[26] On this very same topic, Rodrigues agreed with the two mathematicians in arguing that angels were responsible for the motion of celestial bodies.[27]

Moreover, although these philosophers maintained, in unison with Borri, the corruptibility of the heavens, using, among others, the argument of the astronomical observation of comets moving throughout the celestial region, only Bento Rodrigues explained the appearance of comets as a result of the condensation of the celestial matter itself, as Borri had exposed in his *Collecta astronomica*.[28]

Finally, regarding the composition of celestial matter, none of these philosophers shared the understanding put forward by their mathematician confrères, according to which the heavens were made up of *aura aethera*. Despite recognising that the celestial bodies were composed of elementary matter, neither Rodrigues nor Veloso maintained that celestial matter was exclusively air in a purer state. According to Veloso, the celestial bodies were composed of air, fire and water. Rodrigues, in turn, argued that the planetary heaven was made up of aether, yet he understood aether to be a

22 Veloso, *Opus physicum*, BNP, cod. 4813, f. 166*v*.

23 Rodrigues, *Philosophia naturalis*, BNP, cod. 4838, 11-12.

24 Veloso, *Opus physicum*, BNP, cod. 4813, f. 173*v*.

25 Rodrigues, *Philosophia naturalis*, BNP, cod. 4838, 3.

26 Veloso, *Opus physicum*, BNP, cod. 4813, ff. 179*v*-81*r*.

27 Rodrigues, *Philosophia naturalis*, BNP, cod. 4838, 15, 18.

28 Note, nevertheless, that Bento Rodrigues also accepted the thesis that comets were celestial exhalations. Rodrigues, *Philosophia naturalis*, BNP, cod. 4838, 42.

mixture of air and fire in its purest state.[29] An elemental material composition was also found in the *caelum stellatum* for, as Rodrigues unequivocally stated, "this heaven is an elemental body made up of the four terrestrial elements".[30]

In other words, the philosophers who taught at the College of Santo Antão were utterly familiar with the astronomers' contributions, yet they had a critical understanding of their cosmological meaning. They did not discuss the planetary rearrangement. Accordingly, they did not explicitly express their views on the geo-heliocentric system of Tycho Brahe. Nevertheless, the main cosmological issues that entered the philosophical debate by the hand of Tychonic astronomers (that is, the celestial fluidity and corruptibility, the tripartite division of the cosmos or even the helicoidal path of planetary orbits)[31] were all integrated by philosophers into an Aristotelian-inspired worldview during the seventeenth century. These ideas shaped their cosmological conceptions.

29 Rodrigues, *Philosophia naturalis*, BNP, cod. 4838, 7.

30 Rodrigues, *Philosophia naturalis*, BNP, cod. 4838, 7: "Tale caelum est corpus elementare constans ex quatuor nostris elementis".

31 Rodrigues, *Philosophia naturalis*, BNP, cod. 4838, 18.

Document VIII

Quaestio prima. *De natura caelorum*. Francisco Rodrigues, *Philosophia naturalis*, 1663, BNP, cod. 4838, 1-16

Articulus primus

An caeli sint fluidi, an solidi?

Suppono primo quod caeli sint quaedam corpora composita ex materia et forma quia iam in metaphysica uidimus nullum dari corpus compositum quod esset simplex physice. Suppono secundo quod materia caelestis, et sublunaris sint eiusdem speciei, ut iam uidimus in physica. Suppono etiam non esse quaestionem de caelo Empyreo; nam cum hic sit Beatorum sedes, iure optimo condenda est firmitas et soliditas. Igitur solum est quaestio de aliis duobus caelis (tres enim dabimus tamen infra) nempe de Aethereo et Stellato.

Prima conclusio sit Caelum aethereum seu Planetarum est fluidum. Ita communiter auctores quos citat et sequitur Soares Lusitanus, [*Cursus philosophicus*], De Caelo Disputatio 1, numero 16. Probatur primo ex uariis experimentis: nam saepe obseruatum est Cometas permeare caelos et ascendere supra Solem et usquam ad stellas fixas. Obseruatum est deinde Martem aliquando uersus nos descendisse Veneremque et Mercurium ascendisse supra Solem. Probatur secundo qui cum in Luna dentur montes, ualles et cauitates profundae si Luna moueretur per corpus solidum daretur uacuum: ergo ut impleantur illae cauitates aptius erit quod caelum sit fluidum. Probatur tertio quia si Caelum Planetarum esset solidum, non facile ad nos descenderet Lux Astrorum. Neque dicas posse esse diaphenum, quia respondeo diaphaneitatem non inueniri in corpore nimis crasso ut sunt caeli. […] [1]

Secunda conclusio. Caelum stellatum est solidum. Ita Soares Lusitanus, [*Cursus philosophicus*], numero 21 et pro hac sententia citari possunt omnes illi Auctores, qui dicunt caelos esse solidos. Probatur primo quia sic melius intelligitur dari tres caelos scilicet, unum fluidum, alterum solidum, et alterum Empyreum: nam si secundum caelum constaret etiam eadem fluiditate qua primum tantum differrent accidentaliter. Secundo quia melius sic intelligitur cur stellae aliquae fixae appellentur fixae enim sunt in soliditate illa, et ideo semper conservant eandem inter se distantiam: et sic ab uno tantum motore omnia possunt moueri, quod quid non ita foret si caelum secundum esset fluidum, nam necessarium erat admittere tot motores, quot sunt Astra: sed est superfluum fieri per plura quod potest fieri per pauciora: ergo si unus tantum motor sufficit, admissa soliditate dicendum est secundum caelum solidum esse. Confirmatur quia sic mellius intelligitur quomodo secundum caelum supra se aquas contineat (iuxta illa Aquae quae supra caelos sunt) quantenus hae ad nos difluant.

Articulus secundus
Utrum Astra sint corpora solida?

Prima conclusio. Sol est corpus fluidum constans massa fluida, et lucida per modum auri liquati motu feruentis ac undantis. Ita Soares Lusitanus [*Cursus philosophicus*], numero 35. Probatur quia ita observatum est a mathematicis ope tubi obtici ut uidere est apud ipsum Soares numero 34. Secun-

da conclusio. Luna, Planetae et Stellae fixae massa magis solida et compacta constant; hoc etiam nobis constat ex eisdem obseruationibus, et quidem de Stellis probatur facile quia sunt tanquam aurei claui in caelo tanquam in rota fixi. […] [4].

Quaeres secundo. An Caeli sint corruptibiles? Respondeo affirmate cum Soares Lusitanus et aliis quam plurimis. Probatur primo ex obseruatione nouorum siderum (et talis communiter dicitur noua stella in Cassiopeia inuenta) et cometarum, quae de nouo genita deprehenderunt noui, et doctissimi mathematici a Thicone allegati. Probatur secundo quia in Luna quotidie conseruant [*sic*, observantur] uariae mutationes, idemque est in aliis Planetis et in Sole uidentur modo et obseruantur a mathematicis quaedam maculae, quae antea non uidebantur: sed hoc solum a noua ibi generatione data poterat proueniri, ut ipsi testantur: ergo etc. Confirmatur ex Sacra Pagina praecipue ex illo psalmi 102 Opera manuum tuarum sunt caeli ipsi peribunt, et omnes sicut uestimentum ueterascent, et mutabunt: deinde patet ex Apocalipse Vidi Caelum nouum et terram nouam. Neque dicas Caelum dissoluendum esse per miraculum quia respondeo frustra recurri ad miracula, cum res possit fieri naturaliter: et quidem naturaliter in die iudicii caelum dissoluturum iri colligunt ex uerbis assignatis graues Auctores. […] [5]

Articulus tertius
Quae sit natura Caelorum, et ex qua materia constet Caelum stellatum, Sol, et alia sidera?

Non est quaestio de Caelo Empireo: nam de hoc alibi dicendum. Igitur de primo Caelo [6] sit resolutio. Tale Caelum nihil aliud est quam aula [*sic*, aura] purissima et limpidissima quae ex magis puro aeris et ignis deducta utriusque mixturam habet. Ita Soares Lusitanus [*Cursus philosophicus*], numero 60, cum aliis. Probatur quia ut supra uidimus primum Caelum est fluidum, et in illo stellae mouentur (iuxta communem explicationem) sicut aues in aere, aut pisces in aqua: ergo, etc.

Circa secundum Caelum resolutio sit. Tale caelum est corpus elementare constans ex quatuor nostris elementis. Ita id Soares cum aliis Ecclesiae Patribus. Probatur quia nulla nos necessitas cogit admittere substantiam aliam peculiarem quam contrarii quintam substantiam uocant: ergo, etc. Probatur secundo quia tale Caelum iuxta Theodoretum ideo uocatur firmamentum quia ex aqua prius labili et postea indurata concreuit: ergo, etc. Confirmatur primo quia tale Caelum in die Judicii est dissoluendum, sicut etiam eius stellae: ergo est corpus elementare. Confirmatur secundo quia tale Caelum potest uideri et palpari: sed quia ita se habent constant ex elementis: ergo, etc. […] [7]

Quaestio secunda
De numero et motu Caelorum, et Stellarum, de istarum figura, et magnitude

Articulus primus
De numero Caelorum

Resolutio sit. Tres tamen dantur Caeli. Ita Soares Lusitanus [*Cursus philosophicus*], numero 132, magister Soares [i.e. Francisco Suárez], Teles, Hurtado, Oviedo, et alii. Probatur primo authoritate Sanctorum Patrum, Augusti, Ambrosii, Chrisostomi et aliorum. Probatur secunda ratione, quia nulla

est necessitas admittendi plures caelos, nec pauciores, quam tres: primum scilicet aethereum, in quo uersantur omnes septem Planetae, nempe Luna, Mercurius, Venus, Sol, Mars, Jupiter, Saturnus. Secundum stellatum, et solidum in [11] quo sunt stellae fixae. Tertius Empireum, quod est sedes Beatorum, de hoc infra agemus specialiter. Probatur tertio efficaciter ex uerbis Apostoli Scio hominem raptum usque ad tertium caelum. Quod de Empyreo communiter intelligitur, quia ibi audiuit Apostolus arcana inefabilia. […] [12]

Articulus secundus
De motu Caelorum, et Stellarum figura, numero et magnitudine

Circa motum Caelorum et stellarum sit resolutio. Caelum et Astra mouentur ab Angelis. Ita sententia quam tenent Soares Lusitanus [*Cursus philosophicus*], numero 190, cum paene 20 Auctores. Probatur primo ex illo Job: sub quo curuantur qui portant Orbem, quae uerba de Angelis intelliguntur, qui tanquam Athlantes substinent Orbes Caelesles et Planetas.

Probatur secundo quia tales orbes non mouentur immediate a Deo ut putabat Albertus magnus, quia Deus solum agit mediis secundis. Dices cum Sol ad uocem Josuae stetit dicitur in texto obedeisse Deum uoci hominis: ergo Deus immediate regit Solem. Respondeo negando consequentiam, quia Deus immediate audiuit uocem, et tunc fecit quod Angelus solem sisteret. Probatur tertio praecipue de Planetis, quia tales Planetae non mouentur a Sole per uirtutem magneticam, ut male putarunt aliqui, nam et hoc modo assignarent causam motus rapti, non assignabant causam accessus et recessus.

Probatur quarto quia Astra non mouentur a propria forma, ut plures tenuere: et firmo hoc primo quia Astra non sunt animata, sed solum res animatae ab intrinseco mouentur (definitur enim Vita ab se principium motus): ergo etc.. Dices Elementa non sunt uiuentia, et tamen mouentur ab intrisenco: ergo non bene stat nostra ratio. Respondeo concessa maiore, et data minore, cum maiore ratione quia cuilibet elementorum dedit natura [15] suum motum: et ideo ad illum acquirendum deberet etiam dare motum, et quid quidem extrinseco generandi tribuitur: at uero Astra non habent proprium motum a natura: et ideo si mouentur ab intrinseco, propriae formae tribueretur motus, ac proinde haec esset uiuens [*sic*, essent viventes]. Neque dicas. Astra tendunt ad ubicationes naturales: quia respondeo nullas Astris esse ubicationes a natura constitutas: unde si ad illas fieret motus, non naturae sed Astris tribueretur. Confirmatur secundo quia Astra ualde regulariter mouentur, et Sol modo accedit, et modo recedit a signo Tauri: sed hoc solum ab agente intellectuali fieri potest: ergo non a se ipsis mouentur Astra, sed ab Angelis […]. [16]

Document VIII

English translation. Rodrigues on the nature, number and motion of the heavens and celestial bodies. Francisco Rodrigues, *Philosophia naturalis*, 1663, BNP, cod. 4838, 1-16

First question

On the nature of the heavens
First article
Whether the heavens are fluid or solid?

In the first place, I assume that the heavens are a kind of bodies composed of matter and form as we already saw, in *Metaphysics*, that no composite body (*corpus compositum*) is physically simple. In the second place, I consider, as we already observed in *Physics*, that the celestial and terrestrial matters are of the same species. I presume furthermore that there is no dispute concerning the Empyrean heaven. Since it is the dwelling-place of the Blessed, one should rightfully acknowledge its steadiness and solidity. Therefore, the inquiry focuses only on the two other heavens (in fact, we will discuss the three below), namely the aethereal heaven (*Caelum aethereum*) and the starry heaven (*Caelum stellatum*).

The first conclusion is that the Aethereal heaven, or the heaven of planets, is fluid. This is the general understanding of the authors, whom Francisco Soares Lusitanus quotes and follows [*Cursus philosophicus*], On the Heaven, Disputatio 1, number 16. This conclusion is firstly proven by means of different experiments. It was often observed that the comets penetrate the heavens and lift above the Sun up to the fixed stars. Then, it was seen that Mars sometimes came down towards us while Venus and Mercury rose above the Sun. Second, it is proven because, since mountains, valleys and deep cavities exist in the Moon, if the Moon moved within a solid body, the vacuum would occur. Therefore, to fill [the space of] these cavities, it would be more appropriate for heaven to be fluid. Third, it is proven, because if the Planetary heaven were solid, the light of the stars would not easily come down to us. Do not say that it could be diaphanous, for I reply that diaphaneity is not to be find in bodies excessively thick, such as the heavens. […] [1]

The second conclusion stands that the starry heaven is solid. This is the understanding of Soares Lusitanus [*Cursus philosophicus*], number 21, and we can cite in favour of this notion all those authors who affirm that the heavens are solid. This is proven first because, in this way, we can better understand the existence of three heavens, that is to say, one fluid, another solid and the other one is the Empyrean, for if the second heaven kept the same fluidity as the first one, they would differ only in an accidental manner. Second, because, in this way, we can better understand for what reason some stars are called fixed stars for they are fixed in that solidity and, for that reason, they always keep the same distance between them, being moved, therefore, by means of one single motive agent (*motor*). If this were not the case and the second heaven were fluid, it would be necessary to accept as many motive agents as the number of celestial bodies. It is needless, nevertheless, to employ many agents in what can be produced by fewer means. Accordingly, if one single motive agent is enough, once recognised

the celestial solidity, it should be argued that the second heaven is solid. The proof is because, in this way, we can better understand how the second heaven holds together the waters above it (those waters that are placed above the heavens), so that they do not flow down upon us.

Second article
Whether the celestial bodies are solid?

The first conclusion states that the Sun is a fluid body formed from a fluid and luminous matter like liquid gold, boiling and waving in motion, as Soares Lusitanus [*Cursus philosophicus*], number 35, argues. This view is proven because it was thus observed by the mathematicians through the telescope, as can be found in the same Soares, number 34. The second conclusion is that the Moon, the planets, and the fixed stars are formed from a more solid and compacted matter. This notion is consistent with the same observations. They have easily proven that the fixed stars are just as golden nails fixed in the heaven as if they were wheels. [...] [4]

You ask furthermore whether the heavens are corruptible. I answer affirmatively with Soares Lusitanus and the great majority of authors. This point is proven firstly by the observation of new stars (such is generally recognised to be the case of the new star devised in Cassiopeia) and comets that modern and very skilled mathematicians commissioned by Tycho [Brahe] found out to be produced anew. This conclusion is proven secondly because various changes are daily observed on the Moon and on the other planets. Similarly, some spots, which were previously unseen, are [now] seen and detected in the Sun by the mathematicians. Nevertheless, as these mathematicians declare, those spots could only be made there through a newfangled generation; therefore etc. It is confirmed by the Sacred Scripture, chiefly in *Psalm* 102: [*Initio terram fundasti; et*] *opera manuum tuarum sunt caeli Ipsi peribunt,* [*tu autem permanes*]*; et omnes sicut uestimentum ueterascent,* [*et sicut opertorium mutabis eos*]*, et mutabunt.*[32] Then, as it is exposed in the *Apocalypse*, *Vide Caelum nouum et terram nouam*.[33] Do not tell me that the heaven must be destroyed by miracle because I respond that it is useless to resort to miracles when the phenomena can be explained conformably to nature and, in fact, the influential authors deduced from assigned words that the heavens will be destroyed by natural means on Judgment Day. [...] [5]

Third article
What is the nature of the heavens and of what matter are the starry sky, the sun and the other stars composed?

The question does not focus on the Empyrean heaven, for it will be discussed elsewhere. Therefore, about the first heaven, we claim [6] that this heaven is nothing but a very pure and limpid aura that derives from purest air and fire and contains a mixture of both the elements. This position is held by Soares Lusitanus [*Cursus philosophicus*], number 60, with others. It is proven because, as we saw above, the first heaven is fluid, and the celestial

32 "[Long ago you laid the foundation of the earth, and] the heavens are the work of your hands. They will perish, [but you endure]; they will all wear out like a garment. [You change them like clothing,] and they pass away". Translation in *The Holy Bible*.

33 "Then I saw a new heaven and a new earth". *The Holy Bible*.

bodies move in it (according to the common opinion) just like the birds in the air or the fishes in the water, therefore etc.

On the second heaven, we argue that this heaven is an elemental body made up of our four elements. This view is supported by Soares Lusitanus [*Cursus philosophicus*], number 60, and other Church Fathers. The proof is because no reason compels us to accept a peculiar component, which the adversaries call the fifth element (*quinta substantia*): therefore etc. It is proven furthermore as, according to Theodoret, this heaven is called Firmament precisely because it was made of the water that previously flew and hardened afterwards: therefore etc. This understating is confirmed, first, because that heaven will be destroyed on Judgment Day as well as their stars; it is therefore an elemental body. This theory is also confirmed because that heaven can be perceived with the eyes and felt. It is, thus, formed of elements: therefore etc. […] [7]

Second question

On the number and motion of the heavens and the celestial bodies
On the figure and magnitude of the celestial bodies
First article
On the number of the celestial bodies

We argue that there are three heavens. This notion is supported by Soares Lusitanus [*Cursus philosophicus*], number 132, master Soares [i.e. Francisco Suárez], Teles, Hurtado, Oviedo, and others. It is proven, first, by the authority of the Saint Fathers, Augustine, Ambrose, Chrysostom and the others. It is proven, second, by the use of reason because there is no need to admit either more or fewer than three heavens, that is to say: the first is the aethereal heaven (*Caelum aethereum*), where all the seven planets move, namely the Moon, Mercury, Venus, the Sun, Jupiter [and Saturn]. The second is the starry heaven (*Caelum stellatum*), and solid, where [11] the fixed stars stand. The third is the Empyrean heaven (*Caelum Empireum*) which is the dwelling-place of the Blessed. We will address this topic in more detail below. It is effectually proven, third, by the Apostle's words, *Scio hominem raptum usque ad tertium caelum*,[34] which are commonly interpreted as meaning the Empyrean heaven because there the Apostle heard the secret words that cannot be said. […] [12]

Second article
On the motion of the heavens and the figure, the number and magnitude of the stars

Concerning the movement of the heavens and the stars, we argue that the heavens and the heavenly bodies are moved by angels. This doctrine is held by Soares Lusitanus [*Cursus philosophicus*], number 190, along with almost twenty authors. It is proven, first, from Job's *sub quo curuantur qui portant Orbem*.[35] These words are perceived as referring to the angels, which sustain the celestial orbs and planets just as the Atlantes.

34 "I know a person who was caught up to the third heaven". *The Holy Bible*.

35 "They stoop that bear up the world".

It is proven, second, because those orbs are not moved directly by God, as Albert the Great thought, because God only acts through secondary causes. You declare that since the Sun stops moving upon the order of Joshua, it is said in the text that God acted following the human command: therefore, God guides the Sun directly. I answer denying the consequence because God heard the order directly and then made the angel stop the Sun. It is proven, third, especially regarding the planets, because those planets are not moved by the Sun through a magnetic influence (*virtus magnetica*), as some authors wrongly thought for, this way, they identified the cause of the daily movement of the Prime mobile (*motus raptus*) but not that of the motion of the approach and recession (*motus accessus et recessus*).

It is proven, fourth, because the celestial bodies are not moved by their internal form (*propria forma*) as several authors argued. I make this point, first, because the celestial bodies are not animate beings; however, only the animate beings are moved in an intrinsic way (*ab intrinseco*) (life is indeed defined as the principle of movement in itself); therefore etc. You declare that the elements are not living beings and yet they move by themselves (*ab intrinseco*): therefore, our argument is not well grounded. Conceded the major [premise] and granted the minor, I respond with greater reason because nature provided whatever element you pleased [15] with its own motion and for that reason in order to get it, [the celestial bodies] should also have been furnished with motion and, this way, it is considered being produced in an extrinsic way (*extrinseco*). Nevertheless, in truth, the celestial bodies do not receive their own motion from nature and, therefore, if they moved by themselves (*ab intrinseco*), the movement would be attributed to their own internal form (*propria forma*) and, hence, these would be living beings. Do not even claim that the celestial bodies tend towards their natural places because I answer you that nature assigns no such places to the celestial bodies. Accordingly, if the movement tends towards the natural places, this is due not to nature but to the celestial bodies. It is confirmed, second, because the celestial bodies are moved in an exceedingly constant way, and the Sun regularly approaches and recedes the Taurus constellation. Nevertheless, this regular motion can be produced only by an intellectual entity: therefore, the celestial bodies are moved not on their own but by the angels. […] [16]