DANTE ALIGHIERI'S *QUAESTIO DE AQUA ET TERRA* IN THE RENAISSANCE

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Date of receipt: 12th of December, 2012
Final date of acceptance: 21st of May, 2014

Abstract

This paper analyzes Dante Alighieri's astrological response, in his *Quaestio de aqua et terra* (1320), to the dilemma posed by Aristotelian cosmology regarding the existence of dry earth over watery surface in the system of concentric elemental spheres. Considering that this Treatise was known only in early 16th Century, this work takes into account both the cultural context in which it was received and the Renaissance conceptions on the stellar argument put forward by medieval tradition, proposing from such evidence an interpretation of the scarce spreading of Dante's propositions[1].

Keywords

Dante Alighieri, Aristotelian Cosmology, Astrology, *terra firma*, Globe.

Capitalia Verba

Dante Alighieri, Cosmologia aristotelica, Astrologia, Terra firma, Sphaera.

1. Introduction

Medieval cosmology stemmed from the combination of two traditions: the Greek conception of a sphere of earth surrounded by material orbits of heavenly bodies and the Christian interpretation of this structure. This mix carried as a significant consequence the need to work out the divergences between those explanations without threatening both theological notions and observed phenomena. The debate about the existence of dry earth over watery surface which went through until Greek cosmology was left behind in early 17th Century, is arguably the most relevant example of this process. The widespreading of medieval treatises on this subject during the so called Age of Discovery shows not only the importance of medieval legacy in Renaissance context, but also the complex process of adaptation that previous cosmological conceptions had to undergo in their new cultural stage. The current work intends to analyze the peculiar kind of Dante Alighieri's explanation as it appears in his *Quaestio de aqua et terra* and the cultural context in which it was first disclosed.

2. The *quaestio de aqua et terra* and the problem of elemental spheres

Dante Alighieri (1265-1321) read his *Quaestio de aqua et terra* before Cangrande della Scala's court in Verona in 1320, but this work was known only in early 16th century when Benedetto Moncetti da Castiglione Aretino, Prior of the Paduan Augustinians, discovered and published the text in Venice in 1508. For many years, much of the historiographical debate on this text was concentrated on the work's authenticity, going as far as to propose a forgery plotted by the Augustinian monk[2]. The discovery of the third version of Pietro Aligheri's commentary on the Comedy in mid 20th Century cleared up this dispute as he diplayed in it his father's arguments on the place and shape of water and earth spheres[3].

According to Dante himself, the aim of that work was to report the dispute in which he had taken part time back in Mantua, for, if it seemed it had remained open

1. Research funded by the Government of Chile through a Fondecyt Project (n. 11100203) and by the *Vicerrectoría de Investigación y Estudios avanzados de la Pontificia Universidad Católica de Valparaíso* (project n. 183.713). Translated by Alfonso Iommi. The author thanks sincerely to Amelia Herrera and Sebastián Salivas for their collaborative participation in the preparation of the article such as students of the History Program at the Pontificia Universidad Católica de Valparaiso.

2. Concerning the text's authenticity see: Luzio, Alessandro; Reiner, Rodolfo. "Il probabile falsificatore della *Quaestio de aqua et terra*". *Giornale Storico della letteratura italiana*, 20 (1892): 125-150. The disparition of the original is the main support of this hypothesis.

3. Mazzoni, Francesco. "La questio de aqua et terra". *Studi Danteschi*, 34 (1957): 163-204. About the dispute see the explanatory note in: Bouloux, Nathalie. *Culture et savoirs geographiques en Italie au XIV siècle*. Turnhout: Brepols, 2002: 27 (n. 36).

or unsolved, it was an opinion based in appearances and not in truth[4]. Thus, Dante intended firstly to make public the terms of the debate, and then to single out the reasons by which it was concluded.

However, the History of Medieval thought shows that this was one of Aristotelian Cosmology's most conflicting features, and that it remained unsolved until the complete abandonment of that explanatory system. According to the Stagirite, the earth sphere was surrounded succesively by concentric spheres of water, air and fire[5]. This arrangement resulted from each element's tendency towards its natural place, considering earth the most heavy element and placing it, therefore, in the center of the universe. This explanation implied that earth was completely covered by water, and the existence of *terra firma* or dry earth was physically impossible. Even if Aristotle himself accepted, in other places of his work, the possibility of inhabitable earth in several parts of the sphere[6], he never put forward a theoretical solution to understand its existence. Dante's Treatise belongs to the medieval tradition that tried to settle this issue[7]. In fact, the *Quaestio* sums up many approaches previously adopted and expounds solutions well-known to Europe's scientific *milieu* in early 14th Century[8].

After introducing the subject, Dante describes five arguments that were used in the dispute in defence of placing water over earth: the eccentricity of both elemental spheres, evident to eyesight by watching the earth sphere at times submerged and at times raised over the water sphere; the conception of water as the noblest element and, therefore, necessarily closest to heaven; navigators' perception, according to which mountains are placed below themselves; water's tendency to descend as a proof that water sphere is placed over earth, because otherwise lakes, sources and streams would be dry; and, finally, the link between the course of the moon and

4. Alighieri, Dante. "De forma et situ duorum elementorum aque videlicet et terre", *Tutte le Opere*. Milan: U. Mursia & C., 1965: 915.

5. Aristotle, *De Caelo*, II, 4. 287a (Aristotelis. *Opera*. Oxford: Typographeo Academico, 1837: II, 30-31. 12th September 2012 <http://www.isnature.org/Files/Aristotle>).

6. Aristotle, *Meteorologica*, II, 5, 362b. 287a (Aristotelis. *Meteorologicoum libri IV*. Leipzig: Vogel, 1834: II, 30-31. 12th September 2012 <https://archive.org/details/meteorologicorum01arisuoft>).

7. For an examination of the different arguments displayed, see: Duhem, Pierre. *Le Système du monde. Histoire des doctrines cosmologiques de Platon à Copernic*. Hermann: Paris, 1965: IX, 79-235; Randles, William G. L. "Classic models of world geography and their transformation following the discovery of America", *The Classical Tradition and the Americas*, European Images of the Americas and The Classical Tradition, eds. Wolfgang Haase, Meyer Reinhold. Berlin-New York: Walter de Gruyter, 1994: I, 5-76. Collected also in: Randles, William G. L. *Geography, Cartography and Nautical Science in the Renaissance: The Impact of the Great Discoveries*. Ashgate: Aldershot, 2000: 5-76.

8. Dante's Treatise has been studied from a scientific point of view by: Boffito, Giuseppe. *Intorno alla Quaestio de aqua et terra attribuita a Dante*. Turin: Carlo Clausen, 1902: 75-159; Mazzoni, Francesco. "Quaestio de Aqua et Terra. Introduzione, traduzione e commento di Francesco Mazzoni", *Alighieri, Dante, Opere Minori*. Milan-Naples: Ricciardi, 1979: II, 691-880. The cosmological problem in its turn has been recently considered in: Alexander, David. "Dante and the form of the land". *Annals of the Association of American Geographers*, 76 (1986): 38-49, emphasizing the place of the text in the history of medieval thought. Although Alexander does not quote him, arguably the most important analysis in this perspective was carried out by Duhem early in the 20th Century (widely acknowledged by Mazzoni).

waters that should be expressed by making the eccentricity of the water sphere similar to the orbit of the moon[9].

Afterwards, Dante presents his thesis denying the very possibility of water being higher than the surface of inhabitable earth. In order to achieve this point, he firstly draws on sensitive evidence: given that we percieve rivers flowing downwards to the sea, it is impossible for the water to be higher than emerging earth anywhere around it. He rules out, then, the eccentricity of both spheres by means of an example exploring the consequences this would imply in the diverging descendent courses of these elements to their natural places; and he does so precisely to reject, finally, the existence of a watery swelling contrary both to water's tendency to move towards its center and to its nature, unable to contain itself. He thus concludes that water is concentric with earth and has a spherical surface.

Following his exposition of the arguments backing up his theory, the poet explains the reasons due to which water does not cover completely the earth, considering that by the latter's nature it should lie underneath the former. According to the author, Universal Nature requires that earth raise to achieve the mix between both elements. In fact, says Dante, dry earth is a crescent-moon-shaped excrecence spanning from Cádiz to river Ganges.

After establishing the final cause of this earth swelling, the author devotes the last part of his piece to delineate the efficient cause of the bulge, insisting that his Treatise deals solely with material affairs, separating himself from those who claimed that a divine miracle was enough to solve the question[10]. Thus, he sets off by excluding earth itself as a cause of its swelling, because, as it happens in other elements, it is an homogeneous body that produces no bulge. In absence of other options, Dante places the cause in heaven. He rules out the moon, in the first place, which turns around the whole earth sphere and, therefore, should exert attraction all across the surface and not only in a single portion of the northern hemisphere. By this very same reason, he rejects the influence of every other planetary orbit and of the *primum mobile*, for, being uniform forces, it would be impossible to explain their higher incidence in a unique part of the earth. On this ground, the cause must be found, according to Dante, in the firmament or eighth sphere. For the author, even if firmament is uniform in substance, we can discern in it different sizes of stars and constellations that must be intended to raise the earth over watery surface:

> *Videmus in eo differentiam in magnitudine stellarum et in luce, in figuris et ymaginibus constellationum; que quidem differentie frustra esse non possunt, ut manifestissimum esse debet omnibus in phylosophia nutritis. [...] Unde cum vultus inferiores sint similes vultibus superioribus ut Ptolomeus dicit, consequens est quod, cum iste effectus non possit reduci nisi*

9. In his English edition, Alain Campbell Smith calls these proofs geometrical, ethical, experimental, economical and astronomical. Campbell, Alain. "A Translation of the Quaestio de Aqua et Terra". *Annual Reports of the Dante Society*, 21 (1902): 1-59, especially, 6.

10. That was, for instance, William of Auvergne and Manegold of Lautenbach's response. See: Duhem, Pierre. *Le Système du Monde*...: IX, 109-110; Bartlett, Robert. *The Natural and the Supernatural in the Middle Ages*. Cambridge (UK): Cambridge University Press, 2008: 41-44.

in celum stellatum ut visum est, quod similitudo virtualis agentis consistat in illa regione celi que operit hanc terram detectam[11].

When he asks why this prominence takes place inthe northern hemisphere and not in the southern, Dante states that it is the result of a divine choice which is beyond the limits of human understanding.

Robert Bartlett emphasizes that Dante's naturalist argument, though different from theological arguments put forward by previous authors, should not be considered as an expression of the progress of western science, but as an example of a far more complex intellectual process. Bartlett reminds that the theological explanation strove, at its turn, to counteract solely physical solutions to a cosmological problem. From this point of view, Dante's position would not mean the triumph of a naturalist bias, but just a part of an ongoing debate[12]. This feature is emphasized by Nathalie Bouloux's opposite interpretation of the Treatise. She asserts that the response displayed by the Florentine poet hinders any kind of dicussion because his solution is merely methaphysical and not physical[13]. Thus, while Bartlett considers the *Quaestio* a physical response to the dilemma, Bouloux sees in it a blatant example of a theological resource put into work.

Two important aspects of the Treatise hold this variety of interpretations: the emphasis on divine will as a cause of earhtly things, and the concern with finding a natural cause to explain the elevation of earth mass. Though the latter clearly depends on the former, resorting to the stellar attraction of the earth —similar to the action of a magnet on iron— means giving a physical response determined by a supernatural final cause.

3. The tradition of the astrological argument as explanation of *terra firma*

It is difficult to follow the History of the argument founded on the stellar incidence on the raising of the inhabitable quarter of the earth, for it is found in very few authors among those who deal with the problem of the order of elemental spheres. The very first apparition takes place in the *Commentary to the Sphere of Sacrobosco* written in 1271 by Robertus Anglicus[14]. In relation to Sacrobosco's reference to the existence of dry earth in the northern hemisphere, Anglicus asserts:

11. Alighieri, Dante." De forma et situ duorum elementorum...": 926.

12. Bartlett, Robert. *The Natural and the Supernatural*...: 50.

13. Bouloux, Nathalie. *Culture et savoirs geographiques*...: 29.

14. On Anglicus see the review by: Thorndike, Lynn. "Robert Anglicus". *Isis*, 34 (1943): 467-469. By the same author see: Thorndike, Lynn. "Robertus Anglicus and the Introduction of Demons and Magic into Commentaries upon the Sphere of Sacrobosco". *Speculum*, 21 (1946): 241-243.

> *Tertio nota quod omnia elementa orbiculariter circumdant terram ex omni parte nisi aqua, cuius rei triplex potest esse ratio. Una voluntas divina propter vitam animalium salvandam. Alia siccitas terre imbibens partes aque, ut habetur in De generatione et corruptione, nisi terra esset permixta cum aqua, decideret in pulverem. Tertia est influentia stellarum, ut coniunctio aliqua super aliquam partem terre efficit ipsam siccam, cuius signum est quoniam loca que solebant esse plena aquis modo sunt desiccata*[15].

Thus, according to Anglicus, stellar influence is one of three possible ways of explaining earth's swelling, along with divine will and the dryness of the earth. As Pierre Duhem noticed, notwhitstanding the English astronomer's reproduction of other author's explanations, there is no reference to this argument in prior works. Even though the Brethren of Purity or Sincerity —a group of Arab philosophers established in Basra during 10th Century— had approached in general terms the question regarding the attraction the sky exerts on earth, they had described as well the opposite effect: repulsion[16]. Besides, this tradition —resumed by Al Bitruji in 12th Century— emphasized the influence of stellar movement on continental movement, being a different explanation than Anglicus' and not inteded to give a solution to Aristotle's dilemma[17].

Later than Anglicus, the Dominican Bernard of Trilia (1240-1294) quotes most of the explanations merging the supernatural divine intervention, heavenly universal order and stellar action[18]. For Duhem, this combination is not strange, for if Roger Bacon had solved the Aristotelian question drawing on the action of universal nature instead of turning to the particular nature of elements, and Thomas Aquinas had resorted to universal order, stellar influence was but another name to denote the same kind of teleological explanation about the exceptionality of *terra firma*[19].

The use, in that era, of astrological criteria in natural philosophy is not necessarily in contradiction with the foundations of medieval theology. Even if Eugenio Garin believes that scholastic ordered rationality is unconciliable with the continual questionning of the structures of the universe inherent to astrology —leading to the reduction of this discipline to the field of demonic knowledge and experimental contingency—[20], the existence of nuances in the beliefs about stellar influence gave room enough to Astrology to play a peculiar part in the period's cosmological thought. Although some of the earliest Christian authors had acknowledged a

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15. Thorndike, Lynn. *The Sphere of Sacrobosco and its Commentators*. Chicago: The University of Chicago Press, 1949: 150. In some versions it's added at the end [...] *ut in quibusdam partibus Anglie*. Boffito quotes a version of this passage attributing it to Sacrobosco himself, Boffito, Giuseppe. *Intorno alla Quaestio de aqua et terra*...: 120. The author reproduces as well a section of Averroes commentaries to the *Meteorologica* in which the joint action of the Sun and the stars is mentioned as a cause of dryness in northern earth, Boffito, Giuseppe. *Intorno alla Quaestio de aqua et terra*...: 96.

16. Duhem, Pierre. *Le Système du monde*...: IX, 99.

17. Duhem, Pierre. *Le Système du monde*...: IX, 133-134.

18. Duhem, Pierre. *Le Système du monde*...: IX, 138. Duhem quotes the *Questions de spera edita a Magistro Bernard de Trilia*, Bibliothèque Municipale de Laon. Ms. 171, f. 75.

19. Duhem, Pierre. *Le Système du monde*...: IX, 134.

20. Garin, Eugenio. "Magia y astrología en el Renacimiento", *Medioevo y Renacimiento*. Madrid: Taurus, 1981: 112-124, especially, 117-118.

restricted power to signals conveyed by stars[21], in medieval world the validation of the observation of the skies as a parameter for analyzing and understanding terrestrial world originated in 12th Century. It was then that the translations of Ptolomy's *Tetrabiblos* and Albumasar's *Introduction to Astrological Science* led to a "renovated interest in astrology and a more favourable approach to its doctrines"[22]. If until then available sources were Macrobius' *Commentary on The Dream of Scipio*, Firmicus Maternus' *Mathesis*, latin comentaries on the *Timaeus* and brief mentions by Isidore of Seville and Bede, the spreading of these treatises, preserved and translated by Arabs, made possible to integrate astrological tradition and Aristotelian natural philosophy[23].

Thus, from 12th Century onwards Astrology acquired an increasing relevance as a way to understand cosmos, different when required from horoscopic science. While the former was a respectable branch of natural philosophy, the latter became object of a series of adverse criticism all along the Middle Ages[24] which aimed not as much to the belief in real heavenly influence as to the risk of determinism implicit in stellar dictates[25]. In this way, when astrology was considered a rational discipline providing among other things principles for agriculture, navigation and medical prognosis, different from ceremonies of superstitious invocation of stellar entities, it was a permitted and legal science[26].

According to Edward Grant, Astrology as prediction of events and behaviours from the knowledge of heavenly bodies did not play a relevant part in scholastic philosophy, but the influence exerted by these bodies on terrestrial matter was a principle universally accepted[27]. This idea coincided with a hierarchical conception of cosmos in which the heavenly area should influence and guide the less noble and perfect one[28]. Even if in most cases stellar light and movement were the means of stellar action, when an effect could not be explained through any of them,people resorted to the possibility of a sort of invisible influx radiating from the sky. Some

21. Among them we find Tertullian, Origen, Lactantius and even Saint Augustine. See: Seznec, Jean. *La sopravivenza degli antichi dei. Saggio sul ruolo della tradizione mitologica nella cultura e nell'arte rinascimentale.* Turin: Bollati Boringhieri, 1990: 37-38.

22. Lindberg, David. *Los inicios de la ciencia occidental.* Barcelona: Paidós, 2002: 350-351.

23. Lindberg, David. *Los inicios de la ciencia occidental...*: 350-351; Seznec, Jean. *La sopravivenza degli antichi dei...*: 44. Isidore of Seville's astrological references are contained in his *Etymologiae* and *De rerum natura*, and Bede's in his Treatise on the nature of things. See: Thorndike, Lynn. *A History of Magic and Experimental Science*. New York: Columbia University Press, 1923: I, 632-636. Thorndike asserts that the process was rather the opposite way: the reading of such authors as Firmicus originated an interest in Astrology that led to the search of more texts on the subject. See pages 690-691.

24. Lindberg, David. *Los inicios de la ciencia occidental...*: 346.

25. Lindberg, David. *Los inicios de la ciencia occidental...*: 349.

26. Federici, Graziella. *Medioevo magico. La magia tra religione e scienza nei secoli XII e XIV*. Turin: UTET, 2008: 323.

27. Grant, Edward. *Planets, Stars, & Orbs, The Medieval Cosmos, 1200-1687*. Cambridge (UK): Cambridge University Press, 1996: 569-570.

28. Grant, Edward. *Planets, Stars, & Orbs...*: 612.

phenomena, like magnetic attraction for instance, were explained in such a way[29]. It is not strange, thus, that Dante compared the power of northern hemisphere stars exerted on terrestrial mass with the effect of magnets, for both dealt with an invisible force that caused perceptible effects in sublunar world. This principle, reducible to the concept of a natural or universal order that preserved the cosmos, allowed to solve the dilemma posed by Aristotelian cosmology.

The same argument reappeared in *La composizione del Mondo* by Ristoro d'Arezzo written in Vernacular in 1282. Trying to explain the shape of the world, d'Arezzo follows the Aristotelian distinction of spheres and explains the earth bulge as a consequence of stellar attraction, emphasizing the excellence of northern hemisphere because of the great amount of stars and constellations existing there:

> *Adunque è mistieri per forza di ragione che la terra sia scoperta dell'acqua nella parte diritta del cielo, la quale è più spessa, e più forte e più potente: la qual potemo chiamare per ragione parte di sopra, come quella di settentrione, la quale è piena di figure e di grandissima moltitudine di stelle*[30].

For d'Arezzo, the heavenly virtue acts on water taking it apart from the terrestrial quarter to permit its inhabitability[31]. This last point is one of the few that Dante did not used in his work, keeping instead the insistence on the concentration of stars over the northern hemisphere and the likeness between heavenly attraction and magnetism[32]. We could explain this coincidence by the possible popularity in late Middle Ages —as shown in preserved manuscripts— of *La composizione del mondo*[33]. In fact, Pietro d'Abano (c.1250-1315/16), philosopher, physician and astronomer form the School of Padua, included in one of his most celebrated works, the *Conciliator differentiarum philosophorum et praecipue medicorum*, the astrological argument as a possible cause of the terrestrial bulge[34]. Just like d'Arezzo, the author stated that constellations placed in the northern section held the sea and prevent it from flooding the earth[35]. Nevertheless, he did not adopt this explanation as final and only mentioned it among the causes displayed to resolve the issue.

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29. Grant, Edward. *Planets, Stars, & Orbs*...: 612 and 615.

30. "It is needed, by the force of reason, that the earth is discovered from the water on the straight of the sky, which is thicker, stronger and more powerful. We reasonably can call it part above, like that of the north, which is full of figures and great multitude of stars" (Arezzo, Ristoro d'. *La composizione del mondo*. Rome: Tipografia delle Scienze Matematiche e Fisiche, 1859: 77).

31. Arezzo, Ristoro d'. *La composizione del mondo*...: 78.

32. Alexander, David. "Dante and the form of the land...": 47.

33. Duhem. *Le Système du monde. Histoire des doctrines cosmologiques de Platon à Copernic*. Paris: Hermann, 1954: IV, 207-208. About the manuscripts see: Enrico Narducci's introductory essay to his edition of the text, Arezzo, Ristoro d'. *La composizione del mondo*...: IX-XXXI.

34. Pietro d'Abano had finished this work in the first years of 14th Century. See: Thorndike, Lynn. *A History of Magic and Experimental Science*. New York: Columbia University Press, 1923: II, 879.

35. Duhem, Pierre. *Le Système du monde*...: IX, 151. See: *Conciliator differentiarum philosophorum [et] medicorum in primis doctoris (...) Petri de Abano*. Venice: Luca antonio Giunta, c.1520: f. 18v.

Paolo Veneto (c.1369-1429) picked back this argument in his work *De compositione mundi* which is mostly an abridged translation into Latin of Ristoro d'Arezzo's Treatise[36]. Veneto asserted that the multitude of stars in the northern part of heaven not only turned it into the noblest section of the skies, but also kept the inhabitable quarter free from water[37]. A similar approach was taken by Giovanni Michele Alberto da Carrara (1438-1490) in his *De constitutione mundi*, a work that was most likely never published and kept solely in manuscript form[38]. Even if the Treatise was written in the second half of 15th Century, when the results of Portuguese navigations across southern Africa were widely known, its author kept Ristoro's stellar explanation to undersatnd the exceptional existence of dry earth in northern hemisphere. The contents of this work were hardly original, for all its arguments are drawn from Paolo Veneto and Ristoro d'Arezzo's treatises[39]. As we can see, Anglicus's argument was well received in Italian intellectual *milieu*. This is not strange, for Astrology held there an important place, merging in that time scientific texts with astronomical observations and geometrical deductions[40]. As Fritz Saxl states, if in 13th Century Astrology was a traveller recently arrived from the East, in 15th Century the distance that had separated astrological paganism and medieval christianity no longer existed[41]. In Dante's case this seems to be the only time in his work in which he alluded to the role of heaven in the generation of an inanimated object[42]. Generally his main interest focused on stellar influence on human contexts, acknowledging that our life and other beings' is caused by Heaven (*Convivio*, 4.23). Nevertheless, Dante conciliated this position with Christian perspective for he considered stars as God's instruments to express his will through nature[43].

36. Duhem, Pierre. *Le Système du monde*...: IV, 209-210; Duhem, Pierre. *Ètudes sur Lèonard de Vinci: Ceux qu'il a lus et ceux que l'ont lu*. Paris: Éditions des archives contemporaines, 1984: I, 325. Alexander, omits this relation by affirming that Paolo Veneto repeats Dante's explanation, see 46.

37. Veneto, Paolo. *Liber de compositione mundi*. Lyon: SimonVincent, 1525: chapter XVIII Sub Septentrione terra est aquis discoperta.

38. Thorndike, Lynn. "Relations of the Inquisition to Peter of Abano and Cecco d'Ascoli". *Speculum*, 1 (1926): 338-343, especially, 341.

39. Thorndike, Lynn. "The *De constitutione mundi* of John Albert Michael Albert of Carrara". *The Romanic Review*, 17 (1926): 193-216.

40. Duhem, Pierre. *Le Système du monde*...: IV, 186.

41. Saxl, Fritz. "El renacimiento de la astrología a finales de la Antigüedad", *La vida de las imágenes*. Madrid: Alianza, 1989: 72-81.

42. Kay, Richard. *Dante's Christian Astrology*. Philadelphia: University of Pennsylvania Press, 1994: 4.

43. Kay, Richard. *Dante's Christian*...: 9. As said by Boll and Seznec, even if most rigorous thinkers emphasized the threat for free will implied in stellar power, this did not mean that they refused its conditioning action. Such is Thomas Aquinas' case, who, in *Summa 1.115.4*, concedes to the stars the power to define individual character, and Dante's too, who accepted the influx of cosmic forces in human life in *Purgatory* 16.73-76. See: Boll, Franz. *Storia dell'Astrologia*. Bari: Laterza, 1985: 80-82; Seznec, Jean. *La sopravivenza degli antichi dei*...: 41-42.

4. The spreading of Dante's argument in the Renaissance

In the 1577 edition of his commentary to Sacrobosco's *Sphere*, the Florentine monk Francesco Giuntini (1523-1590)dedicated a long section to the problem of water and earth spheres. Along with reproducing Christoph Clavius's (1538-1612) arguments in favour of a single sphere composed of both elements, Giuntini added as evidence the mention in Dante's *Comedy* of some stars in the southern hemisphere unknown to travellers: *I' mi volsi a man destra, e puosi mente/ a l'altro polo, e vidi quattro stelle/ non viste mai fuor ch'a la prima gente* (Purgatorio, I, 22-24)[44]. A few years later, Francesco Pifferi (1548-1612), a Camaldulean monk, repeated this reference suggesting that even if it was impossible for Dante to know the four stars mentioned, he had at least intuited their existence[45]. This cosmological interpretation of that passage was different from the symbolical and religious one put forward by previous authors such as Cristoforo Landino (1425-1498) who saw in those stars a sign of the four cardinal virtues[46]. In fact, this approach accounts for an attempt to make of Dante a part of that time scientific thought by means of inquiring into geographical and astronomical signs in his work. Notwhitstanding this intention, there is no mention to what is most probaly his only Treatise on the subject.

In his dedication to Cardinal Ippolito d'Este, Benedetto Moncetti introduced the *Quaestio* as an expression of Dante's wit and of his skills in astronomical speculation[47]. Nevertheless, renaissance authors seemed to have preferred to limit themselves to the *Commedia*. Comparing the ideas on southern hemisphere contained in both works, Alfred Hiatt states that the two texts mention the possibility of *terra firma* in the other hemisphere: while in the *Quaestio* the restriction to northern hemisphere is explained as a mistery beyond human understanding, in the *Inferno* the terror that resulted from Lucifer's fall from heaven would have moved earth northwards, turning the current world into an inversion of the original[48]. Thus, there was a poetic and religious justification for the physical explanation of earth prominence caused by stars[49]. It is interesting in this sense that neither Giuntini nor Pifferi, in their attempts for using Dante's statements as proofs of prior knowledge of southern hemisphere, quote the option opened by the *Quaestio*. Although the 1508 edition was apparently hard to find, we believe that its omission was due to the kind of

44. "I turned to the right, and fixed my mind / to the other pole, and saw four stars / unseen before by other people" (Giuntini, Francesco. *Commentarium in Sphaeram*. Lyon: apud Philippum Tinghium, 1577: 201).

45. Pifferi, Francesco. *Sfera*. Siena: appresso Siluestro Marchetti, 1604: 26-27.

46. *Queste quattro stelle pare che pongha per le quattro virtú cardinali, le quali non sono ne gl'huomini perfectamente se non sono in stato di gratia, et però non furon mai viste se non da' nostri primi parenti, quando erono in stato di gratia* (Landino, Cristoforo. *Commento sopra la Comedia*, ed. Paolo Procaccioli. Rome: Salerno Editrice, 2001: III, 1047).

47. Reproduced in Alessandro Torri's edition. *Quistione trattata in Verona da Dante Alighieri intorno alla forma del globo terracqueo ed al luogo rispettivamente occupato dall'acqua e dalla terra*. Livrono: coi tipi di Paolo Vannini, 1843: XII.

48. Hiatt, Alfred. *Terra Incognita. Mapping the Antipodes before 1600*. Chicago: University of Chicago Press, 2008: 128.

49. More on the two explanations in: Alexander, David. "Dante and the form of the land...": 45.

argument put forward by the poet and to the 16th Century interpretation of such an approach.

Alessandro Piccolomini (1508-1579) asserted in his *La sfera del mondo* that the existence of dry earth was the consequence of the heterogeneous density of earth, and because its center of magnitude was different from its center of gravity water did not cover it completely[50]. He stated then that this was the only true reason, refuting those who *vogliono che nel polo Settentrionale, o a quel vicino, sieno alcune stelle, che con la loro influentia impediscono, che l'acqua non copra la terra in qualche parte*[51]. The Jesuit Christoph Clavius, as well, referred, as a defense of a single earth and water globe, to the ridiculous reasons of those who explained the existence of *terra firma* as a consequence of the forces of arctic constellations whose alleged virtue was capable of moving oceans[52]. The disdainful tone used by the most quoted 16th Century cosmological authors makes evident the scarce effect of Dante's response in that time[53].

In his classical history of astrology, Franz Boll says that the reputation of this science constantly grew in the 15th and 16th Centuries, as shown by Pope Julius II and Pope Paulus II's interest in calculating the proper time for some ceremonies and by Pope Leo X's foundation of the Chair of Astrology in the University of La Sapienza[54]. The interpretation of such practices poses a problem that historiography has analyzed from two basic points of view. On the one hand, researchers have emphasized the difference between judicial astrology —aimed at prognosis— and mathematical astrology —devoted to the calculus of astral positions—, an emphasis that "comes down to the distinction between what indicates the developement of scientific research and what is a remain of old religions or a sign of new forms of superstition"[55]. This approach would issue from the same arguments presented by those who strove to defend their activities against their contemporaries' prejudices and apprehensions[56]. Eugenio Garin, on the other hand, considers that this is a false separation, for both points of view merge continually in the writings of that period[57]. In his words, "really, in the Renaissance there is a constant struggle precisely against such a divorce" —between scientific and occult thought— "in favour of a new convergence"[58]. In this sense, the contradiction between science

50. Piccolomini, Alessandro. *La sfera del mondo di M. Alessandro Piccolomini. Di nuovo da lui ripolita, accresciuta, et fino à sei libri, di quattro che erano, ampliata* (...). Venice: Giovanni Varisco e Compagni, 1566: 73.

51. Piccolomini, Alessandro. *La sfera del mondo*...: 73.

52. Clavius, Cristoph. "Commentarium in Sphaeram Ioannis de Sacro Bosco". *Opera Mathematica*. Mainz: Antonii Hierat excudebat Reinhardus Eltz, 1611: III, 16.

53. Piccolomini and especially Clavius were profusely quoted in cosmological issues by their contemporaries. Both Pifferi and Giuntini, for instance, refer to them as authorities in approaching the problems of the *Sphere*.

54. Boll, Franz. *Storia dell'Astrologia*...: 75.

55. Garin, Eugenio. "Magia y astrología en el Renacimiento...": 112-124, see 131.

56. Garin, Eugenio. "Magia y astrología en el Renacimiento...": 131.

57. Garin, Eugenio. "Magia y astrología en el Renacimiento...": 133. See: Garin, Eugenio. *Lo zodiaco della vita. La polemica sull'astrologia dal Trecento al Cinquecento*. Bari: Laterza, 2007: 27.

58. Garin, Eugenio. "Magia y astrología en el Renacimiento...": 124.

and astrology in Renaissance period is denied, since for some authors the principle of astral causality is the natural law *par excellence*, the one law that guarantees the unbreakable regularity of facts and that allows to discover the cosmic order of the universe[59].

Considering these approaches, it is difficult to precise the role of Astrology in that period, not only because of its sometimes implicit presence, but also because what we properly call Astrology is wide enough as to admit distinctions. In the case we now focus on, we can appreciate a transformation during 15th and 16th Centuries that led to the abandonment of the stellar argument as a principle to resolve the dilemma of *terra firma*. If the Florentines who read Ptolomy's *Geography* for the first time were not interested in the idea of a terraqueous globe it included, but their readings were determined by astrological concerns[60], in the mid 16th Century, the possibility of earth in the southern hemisphere was one of the most quoted examples of the text[61], accounting for a turn in the cosmological approach.

A similar attitude could explain the scarce spreading of Dante's ideas put forward in the *Quaestio*. A scan of the catalogues of Renaissance private libraries reveals that during the 15th Century the only text contained in those collections that reproduced the stellar argument as an explanation of the existence of uncovered earth was Pietro d'Abano's *Conciliator*[62]. Although the important library of Cardinal Bessarion kept

59. Seznec, Jean. *La sopravivenza degli antichi dei...*: 51. On the influence of astrological thought in Renaissance science, see: Vernet, Juan. *Astrología y astronomía en el Renacimiento*. Barcelona: El Acantilado, 2000: 9-31.

60. Gautier, Patrick. *La Gèographie de Ptolémée en Occident (IVe-XVIe siècle)*. Turnhout: Brepols, 2009: 168 and 214. Thomas Goldstein, in a different interpretation, insist in the influence exerted by the idea of navigable southern hemisphere on the Florentines. See: Goldstein, Thomas. "Geography in Fifteenth-century Florence", *Merchants and scholars. Essays in the history of exploration and trade*, John Parker, ed. Minneapolis: University of Minnesota Press, 1965: 9-32.

61. See: de Rinaldi, Dante. *La Sfera di messer Giovanni Sacrobosco tradotta emendata & distinta in capitoli da Piervincentio Dante de Rinaldi con molte e utili annotazioni del medisimo. Rivista da frate Egnatio Danti cosmografo del Gran Duca di Toscana*. Florence: Stamperia de Giunti, 1571: 35; Giuntini, Francesco. *La Sfera del mondo*. Lyon: Appresso Simforiano Beraud, 1582: 275-276.

62. Contained in Piero Leoni and Giovanni Pico della Mirandola's libraries. See: Dorez, Léon. "Recherches sur la bibliothèque de Pier Leoni, médecin de Laurent de Médicis". *Revue des Bibliotèques*, 7 (1897): 81-106; Pearl Kibre. *The library of Pico della Mirandola*. New York: Columbia University Press, 193. In addition to this we checked the following catalogues: Giorgio Valla's in: Heiberg, Johan L. "Beiträge zur Geschichte Georg Valla's und seiner Bibliothek". *Beihefte zum Centralblatt für Bibliothekswesen*, 16 (1896); Medici's in: Ullman, Berthold L.; Stadter, Philip. *The Public Library of Renaissance Florence*. Padua: Antenore, 1972; Pietro Barozzi's in: *Librorum XV saec. Impressorum indez. Appendix Petri Barocii Bibliothecae intvantarium, E. Govi recensuit*. Padua: Typ. Antoniana 1958; Nicholas of Cues' in: Marx, Jakob. *Verzeichnis der Handschriften-Sammlung des Hospital zu Cues*. Trier: Schaar und Dathe, 1905; Angelo Decembrio's in: Capelli, Adriano. "Angelo Decembrio". *Archivio Storico Lombardo*, 19 (1892): 110-117; Francesco Filelfo's in: Calderini, Aristide. "Ricerche intorno alla biblioteca e alla cultura greca di Francesco Filelfo". *Studi Italiani di Filologia Classica*, 30 (1913): 204-424; Guarino Veronese's in: Omont, Henri. "Les manuscrits grecs de Guarino de Vérone et la Bibliothèque de Ferrare". *Revue des Bibliothèques*, 2 (1892): 78-81 and Francesco Petrarca's in: de Nolhac, Pierre. "Le catalogue de la Premiére Bibliothéque de Pétrarque a Vaucluse". *Revue des Bibliothéques*, 16 (1906): 341-344.

works by Robertus Anglicus and Paolo Veneto, neither the former's commentary on the *Sphere* nor the latter's *De compositione mundi* are mentioned[63].

Pietro d'Abano's case could illustrate how the period's intellectuals considered the medieval astrological approach. As Graziella Federici Vescovini shows, some authors of that era turned the keen doctor and rational philosopher into a magus trading with devils[64]. Although in the *Conciliator* its author only referred to the explanation put forward by Anglicus, the judgment on his work accounts for the transformation undergone by Astrology as a scientific discipline and reveals the change that took place from the second half of 15th Century onwards. Pico della Mirandola, for instance, refused to accept the existence of hidden lunar powers, acknowledging only the influence of light and movement[65]. This attitude had started to become established when Moncetti's 1508 edition appeared and it is not surprising that cosmologists in that period were reluctant to adopt or even mention Dante's theory. In fact, we find a confirmation of this if we check the catalogues of 16th Century thinkers' libraries, which shows the absence of references not only to the *Quaestio*, but also to other works that presented the stellar argument about *terra firma*[66].

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63. Labowsky, Lotte. *Bessarion's Library and the Biblioteca Marciana. Six early inventories*. Rome: Ed. Di Storia e Letteratura, 1979.

64. Federici, Graziella. *Medioevo magico*...: 348.

65. Garin, Eugenio. *Lo zodiaco della vita*...: 90.

66. We checked the catalogues of the following libraries: Girolamo Aleandro's in: Léon Dorez. "Recherches sur la bibliothèque du cardinal Girolamo Aleandro". *Revue des Bibliothèques*, 2 (1892): 49-68; Léon Dorez. "Nouvelles recherches sur la bibliothèque du cardinal Girolamo Aleandro". *Revue des Bibliothèques*, 7 (1897): 293-304; Erasmus of Rotterdam's in: Husner, Fritz. "Die Bibliothek des Erasmus", *Gedenkschrift zum 400. Todestage des Erasmus von Rotterdam (Herausgegeben von der Historischen und Antiquarischen Gesellschaft zu Basel)*. Basel: Braus-Riggenbach, 1936: 228-259; Pope Julius II's in: León Dorez, "La bibliothèque privée du pape Jules II". *Revue des Bibliothèques*, 6 (1896): 97-124; Leonardo da Vinci's in: Fabio Frosini "La biblioteca di Leonardo da Vinci" available in <www.picus.sin.it/documenti/LdV_biblioteche_dei_filosofi.pdf>; Willibald Pirckheimer's in: Emile Offenbacher, "La bibliothèque de Wilibald Pirckheimer". *La bibliofilia*, 40 (1938): 241-263; Johannes Reuchlin's in: Karl Christ. *Die Bibliothek Reuchlins in Pforzheim*. Leipzig: O. Harrassowitz, 1924; Zwinglio's in: *Huldrych Zwinglis Bibliothek / Katalog von Zwinglis Bibliothek*, ed.Walter Köhler. Zürich: Beer, 1921; Èlie Vinet's in: Védère, Xavier. "Catalogue de la Bibliothèque d'Elie Vinet". *Bull. et Mémoires de la Société archéologique de Bordeaux*, 61 (1962): 83-86; Nicolas Colin's in: Henri Jadart. "Nicolas Colin. Sa vie, ses œuvres et sa bibliothèque". *Revue de Champagne et de Brie*, 4/17 (1892): 313-349 and 431-442; John Dee's in: *Catalogus librorum bibliothecæ externæ Mortlacensis D. Joh. Dee, Aº 1583, 6 Sept. [Transcribed from the MS. in the library of Trinity College, Cambridge.] List of Manuscripts formerly owned by Dr. John Dee. With preface and identifications by M. R. James*. London: 1921; Galileo Galilei's in: Favaro, Antonio. "La libreria di Galileo Galilei descritta e illustrata". *Bullettino di Bibliografia e di storia delle Scienze matematiche e fisiche*, 19 (1886): 219-293; Favaro, Antonio. "Appendice alla prima libreria di Galileo Galilei descritta e illustrata". *Bullettino di Bibliografia e di Storia delle Scienze Matematiche e fisiche*, 20 (188): 372-376; Justus Lipsius' in: Théophile Simar, "Notice sur les livres de Juste Lipse conservés à la Bibliothèque de l'université de Leyde". *Revue des Bibliothèques*, 17 (1907): 261-283 and in: *Bibliothecæ Petaviana et Mansartiana: ou, Catalogue des bibliothèques de feu Messieurs A. Petau... et François Mansart... Aux quelles on a ajouté le cabinet considérable des manuscrits du fameux Justus Lipsius*. The Hague: 1722; Montaigne's in: Bonnefon, Paul. "La bibliothèque de Montaigne". *Revue d'Histoire littéraire de la France*, 2 (1895): 313-371 and; Villey, Pierre. "Les Lectures de Montaigne et leur chronologie", *Les sources & l'évolution des «Essais» de Montaigne*. Paris: Hachette, 1908: I, 52-294; Mulerius, Nicolaus. *Catalogus librorum clarissimi celeberrimique viri D. Nicolai Mulerii*. Groningen: 1646; Jehan Piochet de Salins's in: Crasta, Francesca

Catholic Church's explicit position against Astrology consolidated from mid 16th Century. If during the first half of the *Cinquecento* the condemnation of books aimed especially at avoiding the spreading of reformed doctrines, from the 50's onwards divinatory arts, as a class, were also included[67]. In Pope Paulus VI's Roman *Index*, published in 1559, judicial Astrology was condemned, excluding only stellar observation used for naval, agrarian or medical purposes[68]. In addition to this, the *Index* explicitly mentioned Pietro d'Abano and Robert Anglicus[69], the two most influential authors who had addressed in their works to the principle of stellar attraction of earth mass[70]. In 1586, Pope Sixtus V promulgated his well-known bull *Coeli et Terra* in which he declared himself against the practice of judicial astrology and the ownership and reading of books on the subject, allowing only the forms of natural astrology mentioned in the 1559 *Index*[71]. Even if this prohibition had an evident impact on the decrease of publications on this subject or at least on the acknowledgment of their ownership[72], it also makes visible the attempt at distinguishing between divination and the uses of stellar observation in scientific and daily activities. If on the one hand it rejected the form of determinism implicit in horoscopes, on the other hand it accepted the influence of stars in sublunar world. Now, the form of this influence was a point at issue, and the solution of cosmological aenigmas by means of an occult astral resource was considered then a simplifying and ignorant argument, or even "ridiculous" as Clavius said about the astrological explanation of *terra firma*.

Thus, when Francesco Storella in 1576 published the second edition of the *Quaestio* in Naples, he made it a part of a collection of scientific works that included

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Maria; Ragghianti, Renzo. "La Biblioteca di Jehan Piochet de Salins e il Seigneur de la Montaigne". *Rinascimento*, 46 (2006): 403-477; Guillaume Pellicier's in: Omont, Henri. "Inventaire de la bibliothèque de Guillame Pellicier évêque de Montpellier (1529-1568)". *Revue des Bibliothèques*, 1 (1891): 161-172; Joseph Justus Scaliger's in: *Catalogus librorum bibliothecae illust. viri Josephi Scaligeri*. Leiden: Officina Thomae Basson, 1609; Girolamo Sirlet's in: Dorez, Léon. "Recherches et documents sur la bibliothèque du cardinal Sirleto". *Mélanges d'archéologie et d'histoire*, 11 (1891): 457-491; Bonaventura Vulcanus' in: *Bibliotheca Bonaventurae Vulcanii*. Leiden: Officina Plantiniana Raphelengii, 1610. Even if in some cases commentaries to Sacrobosco's *Sphere* are referred to, Robert Anglicus' name does not appear at all. We must mention as well that Ristoro d'Arezzo's Treatise remained unpublished until 19th Century. Most of the catalogues checked can be found in the site picus.sns.it constructed by the Gruppo di ricerca sulle Biblioteche filosofiche private in età moderna at Scuola Normale Superiore di Pisa.

67. Thorndike, Lynn. *A History of Magic and Experimental Science*. New York: Columbia University Press, 1953: VI, 146.

68. Thorndike, Lynn. *A History of Magic*...: IV, 147.

69. *Index Auctorum et Librorum, qui ab Officio Sanctae Rom et Universalis Inquisitionis caveri ab omnibus et singulis in universa Christiana Republica mandantur.* Rome: ex officina Saluiana, 1559: 57 and 60.

70. Their names appeared in the *Index Librorum Authorumque S. Sedis Apostolicae Sacrique Concilis Tridentini authoritate prohibitorum*. Munich: ex. Adamus Berg, 1582: 85 and 87; and in *Index librorum prohibitorum: cum regulis confectis per Patres à Tridentina Synodo delectos; auctoritate Pii IIII primus editus, postea vero a Sixto V auctus, et nunc demum S.D.N Clementis Papae VIII iussu recognitus & publicatus/ instructione adiecta De exequenda prohibitionis, deque sincere emendandi & imprimendi libros, ratione*. Rome: Impressores Camerales, 1596: 34, 57 and 59.

71. Thorndike, Lynn. *A History of Magic*...: VI, 156-157.

72. Thorndike, Lynn. *A History of Magic*...: VI, 157-158.

among other titles a translation of *Asclepius* annotated by the editor himself[73]. Storella was a professor of Rhethoric at the University of Naples and is remembered for publishing the last Latin edition of the pseudo-Aristotelian treatise on magic and astrology *Secretum secretorum*. As William Eamon says, in 1576 the work was widely considered spurious and it was rarely mentioned during the 16th Century as a part of the Aristotelian corpus. In fact, he asserts that Storella payed more attention to the work than usual, if we keep in mind the scholarly opinions his contemporaries shared regarding the text[74]. From this point of view, the second edition of Dante's Treatise was due to an author's interest in the divulgation of writings on astrological magic, which accounts for the position that a cosmological explanation like Dante's took in late *Cinquecento*. It is not surprising then, that the reputation of the Florentine poet were protected by Giuntini or Pifferi, who preferred to remember his inspired allusion to the Southern Cross contained in the *Commedia* rather than praising his analysis of the existence of uncovered lands included in the *Quaestio*.

5. Conclusion

The explanation put forward by Dante Alighieri to the dilemma posed by Aristotelian cosmology is part of the medieval tradition that strived to link the structure of sublunar world and celestial spheres. From this approach, the attribution of an invisible but active force to the stars echoed the interest in submitting the terrestrial phenomena to astral designs, considered as an expression of divine will. Thus, the stellar argument enjoyed some good fortune among authors who emphasized this connection and did not intend to solve physical problems solely by means of perceptible and checkable natural variables. When the text became known for the first time early in the 16th Century, the intellectual scene was different enough to make such an explanation obsolete. Renaissance authors preferred to quote Dante's alleged intuitions regarding the southern hemisphere included in the *Commedia* rather than associate him to Robert Anglicus or Pietro d'Abano's cosmological conceptions.

The transformation suffered by cosmological thought during the Renaissance implied a negative assessment of Dante's argument, as reflected in Piccolomini and Clavius disdainful remarks on the possibility of stellar influence as a cause of earth swelling. The progressive acceptation of the terraqueous globe as a reality and the knowledge of southern continents, clearly increased the dismissal of this idea first put forward in late 13th Century. Along with this, the increasing caution regarding the beliefs in stellar influences on earth and the following ecclesiastical condemnation, ended up by weakening the spreading of the medieval explanation.

73. See Torri's edition: XV.

74. Eamon, William. "How to read a Book of Secrets", *Secrets and Knowledge in Medicine and Science, 1500-1800*, Elaine Long, Alisha Rankin eds. Farnham-Burlington: Ashgate, 2011: 23-46, especially, 24-25.