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PUTTING THE EARTH IN HEAVEN. PHILIPS LANSBERGEN, THE EARLY DUTCH COPERNICANS AND THE MECHANIZATION OF THE WORLD PICTURE

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Finally, the annual motion serves us as a step which enables us to climb the ladder of the celestial spheres upwards. The sphere of the Earth has been given to us as a measure for the whole visible universe. In this way, God makes it clear to us that heaven too is made for man. Moreover, as the measuring of the temple in the vision of Ezekhiel (Ezekhiel 40-42) meant that God's temple was to be rebuilt, the recent (modest) results in measuring the heavens demonstrate that the Day of Judgment is impending.[21]

In sum, Lansbergen's defence of the motion of the Earth was certainly not connected to a more mechanical look at the world. Apart from his Copernicanism, Lansbergen's views on the heavens and the universe did not differ much from those of his contemporaries. The idea that the motions of the celestial spheres were harmoniously ordered was rather commonplace at the time. At Leiden, it dominated much of the thinking about the constitution of the universe. Lansbergen stuck to the belief in solid celestial orbs and regular circular motions. Moreover, Lansbergen remained convinced that the heavens were a domain well distinct from the terrestrial realm. He also kept to the idea that the planets, by their qualities, influence the generation and decay of things on Earth, although, as a Calvinist minister, he was somewhat reluctant about judiciary astrology. He did turn this into an argument for heliocentrism, however. According to him, God had put the Earth among the planets in order that it would receive the most benefit from their influences.[22] So, Lansbergen defended heliocentrism with the arguments familiar from the geocentric world-view.

Models of the moving Earth

Lansbergen's world-picture is dominated by religious ideas and final causes. He hardly paid any attention to more basic physical principles. However, in arguing the motion of the Earth he also had recourse, apart from metaphors about motherly care and brooding chickens, to the workings of instruments. Physical arguments are dealt with only in passing and implicitly. Still, these instrumental analogies may elucidate his views on the causes and nature of the motion of the Earth. A famous instrument to demonstrate the

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[21] *Ibid.*, p. 72. In a poem on the nova of 1604, Lansbergen interpreted it as announcing the Last Judgment. See F. Hallyn, *Un poème inédit de Philippe Lansbergen sur l'étoile nouvelle de 1604*, «Humanistica Lovaniensia. Journal of neo-latin studies», 46, 1997, pp. 258-265.

[22] Lansbergen, *Bedenckingen* (cit. note 5), pp. 77-79.

motion of the Earth, praised and recommended by Lansbergen,[23] was the famous *tellarium*, or heliocentric sphere, built by the Amsterdam publisher, cartographer and instrument-maker Willem Jansz. Blaeu. Common spheres or celestial globes took a geocentric point of view. Blaeu, a convinced Copernican, wanted to produce an instrument which gave a realistic view of the celestial motions. This did not prove easy and only after many years of work the instrument was completed to his satisfaction. Lansbergen mentioned it as early as 1629, but it was patented only in 1634. It was a luxury toy for wealthy amateurs, but it also served as a kind of propaganda for the heliocentric system.

Blaeu's heliocentric sphere was a mechanical construction and one may be tempted to regard it as a mechanical analogy of the solar system. But as far as we can tell, the instrument served just to demonstrate the motions themselves and was not used to explain or elucidate their nature. It was an astronomical, not a physical instrument. It represented the celestial motions, but did not go beyond that. In this respect, it can be compared to a still older model of the Earth's motion, a wooden instrument which served to demonstrate the 'third motion' of the Earth according to the theory of Copernicus, built by the well-known Dutch engineer, Adriaen Anthonisz (1541-1620). It consisted of two globes, representing the Sun and the Earth, joined by a wooden stick in such a way that the globe representing the Earth could move around the other, but in such a way that its axis always pointed in the same direction. According to Isaac Beeckman, it was used by Willebrord Snellius, probably in the years 1609-1610, when Beeckman was a student at Leiden university and Snellius was teaching there as an assistent to his father. Snellius was sympathetic to the Copernican system. However, the instrument seems to have been used mainly for didactic purposes. (Adriaen Anthonisz indeed is not known as a follower of Copernicus.) It did not serve to propagate the Copernican system, but showed a motion which many people apparently found hard to imagine.[24]

The reference to Blaeu's heliocentric sphere therefore does not tell us much about Lansbergen's physical views. This is quite different in the case of another instrument he referred to, an alchemical instrument or *perpetuum*

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[23] *Ibid.*, p. 23.

[24] The instrument is described by Nicolaus Mulerius in a note to book I, chapter XI in his edition of *De revolutionibus*: N. COPERNICUS, *Astronomia Instaurata, libris sex comprehensa, qui de revolutionibus orbium coelestium inscribuntur*, Amsterdam, Jansonius, 1617, pp. 28-31. The description by Beeckman is found in *Journal tenu par Isaac Beeckman de 1604 à 1634*, edited by Cornelis de Waard, 4 vol., The Hague, Nijhoff, 1939-1953, vol. I, p. 21. Beeckman's note dates from 1613-1614.

mobile by Cornelis Jansz. Drebbel, from Alkmaar. This was not just a representational or didactic model, but an instrument which actually embodied, or so Drebbel claimed, the hidden forces which move and animate the universe. Drebbel, who appears to have been heavily influenced by Hermetic notions, claimed to have found the source of all motion in the universe and be able to construe a globe that was turning all round continuously, one turn every 24 hours. I shall not elaborate on Drebbel's real accomplishments here. Suffice it to say that the instrument was prominently announced in a dedication to King James of England and that many people at the time believed his claim.[25]

Drebbel wrote about his instrument as representing the motion of the heavens, not the Earth, and so did most authors who mentioned it. But some of his countrymen rather preferred to regard it as a proof for the motion of the Earth. Gerrit Schagen, equally from Alkmaar, in 1607 announced Drebbel's invention of a perpetuum mobile to the Dutch public. (He published it together with a Dutch translation of the *Corpus hermeticum*). He felt that Drebbel's invention promoted astronomy by getting rid of superfluous hypotheses and calculations. Would Drebbel's science be more widely known among astronomers, «astronomy would be easy, and Copernicus would flourish: for he proves (by reason) that the Earth moves all round every 24 hours. But this philosopher from Alkmaar is able to prove the same not just by reason, but also with living instruments».[26]

Now, Drebbel's instrument was also referred to, apparently independently from Schagen, by Lansbergen – not in *Bedenckingen*, but in an earlier, more scholarly work, his *Progymnasmatum* of 1619. Lansbergen regarded it as a product of 'lower astronomy' (alchemy). Against Tycho, he stated that from alchemical writings it is clear «that the daily rotation visible in the heavens is in reality proper to the Earth». Principal witness to this effect was Drebbel, who had demonstrated so with his own hand. Conclusive seems to be the question whether Drebbel's globe is turning from west to east, as the Earth is supposed to do according to Copernicus, or from east to west, as the heavens do according to Ptolemy. «Those who nowadays exert this art [alchemy], know that the *terra physica* not only moves all around in a day, but, what is particularly remarkable, that it is moved continuously from west to east. I

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[25] See on Drebbel's instrument VERMIJ, *The Calvinist Copernicans* (cit. note 3), pp. 92-95.

[26] G.P. SCHAGEN (ed.), *Wonder-vondt van de eeuwighe beweghingh die den Alckmaersche philosooph Cornelis Drebbel door een eeuwigh beweghende gheest in een cloot besloten te weghe ghebrocht heeft, welckers toeeygeningh (in 't vereeren des selvigen aen den grootmachtigen Coningh Jacob van Groot Brittangen) alhier naecktelijck vertoont word...*, Alkmaar, Jacob de Meester, 1607, dedication.

do not have any doubt that the great Earth (*Tellus*) too is moved in a day in the same way, according to the saying by Hermes Trismegistus, *Sic mundus creatus est*, which I earnestly approve».[27]

A LIVING INSTRUMENT

At first sight, this body turning all round every 24 hours and in this way mirroring the Earth, is very reminiscent of William Gilbert's ideas on magnetism, published in *De magnete* in 1600. Gilbert regarded magnetism as a cosmical, vital force and the Earth as a big magnet. He made experiments with little magnets which he called *terrellae*, little Earths, and which, he believed, showed the characteristics of the Earth in miniature. One might surmise that Lansbergen's reference to *terra physica* was inspired by these experiments of Gilbert, especially as the relevance of Gilbert's ideas to cosmological thinking was early recognized.[28]

However, there are also important differences. Gilbert nowhere associated his theories with Hermetic ideas or alchemy, and Lansbergen's *terra physica* appears, on closer look, not identical with Gilbert's magnets. Lansbergen recognized the magnetic nature of the Earth, but distinguished it clearly from the Earth's moving qualities. Discussing the question whether the Earth underwent three motions at a time, he maintained that two of the three motions Copernicus had attributed to the Earth were strictly speaking no motions at all. Only the Earth's diurnal rotation was due to a proper motion, «as if it were some living being [*ac si animal quoddam esset*], in order that none of its parts would be deprived of the Sun's life-giving light». The annual motion is not a proper motion of the Earth, «but comes forth from the moving force which inheres the Earth's sphere». This, again, happens particularly for the good of man.[29] That the Earth's axis remains in constant position during this deplacement (Copernicus' 'third motion'), finally, is due to the mag-

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[27] P. LANSBERGEN, *Progymnasmatum astronomiae restitutae liber I. De motu solis*, Middelburg, Richard Schilders, 1619, p. 106. A re-edition at Middelburg, Zacharias Roman, 1628, is identical to this first edition. «Sic mundus creatus est» is a quote from the *Tabula Smaragdina*.

[28] J.A. BENNETT, *Cosmology and the magnetical philosophy, 1640-1680*, «Journal for the history of astronomy», 12, 1981, pp. 165-177. M. BALDWIN, *Magnetism and the anti-Copernican polemic*, «Journal of the history of astronomy», 16, 1985, pp. 155-174. S. PUMPHREY, *Neo-Aristotelianism and the magnetic philosophy*, in *New perspectives on Renaissance thought*, edited by John Henry, Sarah Hutton, London, Duckworth, 1990, pp. 177-189.

[29] LANSBERGEN, *Progymnasmatum* (cit. note 27), p. 113.

netic quality which inheres to the Earth. This is not a motion at all; magnetism is not a cause of motion, but of rest.[30]

As it seems, it is only with the works of Kepler that Dutch astronomers came to regard magnetism as a moving force, which could account not just for the immobility, but also for the motions of the Earth. Johannes Phocylides Holwarda, professor at Franeker and one of the first Copernicans to occupy a Dutch chair, even maintained that the fixed stars too are moved by a magnetic force which originates in the Sun. By this, he did not mean the daily rotation, which as a Copernican he ascribed to the Earth, but the precessional motion, which he attributed, like Lansbergen, and for the same reason, to the stars themselves.[31]

To Lansbergen, however, magnetic force was no mover. His *terra physica* is therefore definitely not the same as Gilbert's *terrella*. The motion of the *terra physica* should be equaled to the motion by which the Earth, as a living being, preserves and maintains itself. The comparison of the Earth with a living being appears well in line with Schagen's qualification of Drebbel's globe as a «living instrument» (a term he borrowed, by the way, from Drebbel himself). It might be argued that this term was meant purely metaforically. Beeckman used the term «living wheels» as a synonym for a perpetual motion machine: «Only God makes living wheels or perpetuum motum», he stated in 1626 dismissing a new design of a mill. However, he may have borrowed the term from Drebbel, whose work he was familiar with and whom in his youth he even may have met.[32] Schagen, on his very title page, spoke of the perpetual motion that Drebbel «has wrought by a perpetually moving spirit, enclosed in a globe». The animistic tenor appears to be deliberate.[33]

So, Lansbergen very well could defend Copernicanism without bothering about new physical principles. His writings clearly indicate that he regarded the constitution of the universe not primarily as a question of natural philosophy, but as a question of divine grace. His frequent use of analogy is not just a rhetorical manoeuvre. Lansbergen really believed that the Earth was moving

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30 *Ibid.*, p. 114.

31 J.P. HOLWARDA, *Friesche sterre-konst, ofte een korte, doch volmaeckte astronomie, met de nuttigheden van dien*, Harlingen, Jan Hessels, 1651-1652, pp. 230-231.

32 On Beeckman and perpetual motion, see K. VAN BERKEL, *Isaac Beeckman en de mechanisering van het wereldbeeld*, Amsterdam, Rodopi, 1983, pp. 225-226. On Beeckman and Drebbel, *ibid.*, 247-248. Drebbel was in Middelburg in 1600 or 1601, constructing water pumps for the town. Beeckman's father at the time lived at Middelburg as a.o. a maker of water-conducts.

33 Actually, this element brings one closer to Gilbert again. Gilbert saw magnetism very much as a living force and his magnetic Earth had strong vitalistic connotations.

for the good of man and that this was its ultimate cause. He not only saw the heavens as announcing God's power and might, but he believed that it was this role which ultimately determined their size, their splendor, their harmonious motions and their qualities.

THE EARTH AMONG THE PLANETS

Clearly, Lansbergen did not feel any need to support his world-view by physical explanations. Now, what enabled him to dismiss physics in such an off-hand manner was, I would suggest, exactly his Copernicanism. Copernicus had put the Earth among the stars. Henceforth, the Earth was regarded as a celestial body, endowed with celestial qualities. This meant that one no longer were constrained by the traditional terrestrial physics. So, in looking for a new celestial dynamics in the wake of Copernicanism, we may be looking in the wrong direction. Heliocentrism affected not so much the view of the heavens, as the ideas about the Earth.[34]

In itself, the reference to an ever-turning globe does not appear very peculiar to Lansbergen. Mulerius mentioned that many artisans tried to built a similar instrument in order to have a perfect time-keeper.[35] Lansbergen could take the motion of the instrument for granted. But whereas most people took it as moving with the heavens, Lansbergen stated it was moving with the Earth. Drebbel's sphere could be seen either as an image of the heavens or the Earth, depending on one's ideas of what was really moving.

We meet a similar case in Gilbert's theory of the magnetic nature of the Earth. Traditionally, the force which was directing the magnetic needle, was located in the heavens. Gilbert attributed it to the Earth. Here again, the Earth was endowed with traditional celestial qualities. As stated, cosmological thinkers frequently had recourse to this new quality of the Earth. Like Lansbergen, Simon Stevin too (in 1608) referred to it as a force which kept the Earth's axis in a fixed position. Stevin, who acknowledged to have taken the idea from Gilbert, generalized the idea to some other characteristics of planetary orbits as well. For instance, he thought that the moon's apogee was also kept in place by some kind of magnetic force, which was located

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[34] That Copernican astronomy affected ideas on the Earth was pointed out by G. GOHAU, *Les sciences de la terre aux XVII^e et XVIII^e siècles*, Paris, Michel, 1990, p. 71. On the relation between the Earth and the celestial bodies, see also S.J. DICK, *Plurality of worlds. The origin of the extraterrestrial life debate from Democritus to Kant*, Cambridge etc., Cambridge University Press, 1982, pp. 61-105.

[35] N. MULERIUS, *Institutionum astronomicarum libri duo*, Groningen, J. Sas, 1616, p. 113.