"Ghosts in the Celestial Machine: A Reflection on Late-Renaissance Embodiment," in Embodiment: A History, Oxford Philosophical Concepts, ed. Justin Smith (Oxford: Oxford University Press, 2017), pp. 317-323.

Ghosts in the Celestial Machine

A REFLECTION ON LATE RENAISSANCE EMBODIMENT

Jonathan Regier[1]

The nature of celestial life was hotly debated in the long history of Aristotelian philosophy. Even if Aristotle and important commentators like Averroes said the heavens were alive, the Scholastics generally had nonliving spheres guided by angels.[2] The very regularity of celestial movement showed that celestial being, whatever it was, was superior to the flux and impermanence down here on what Dante, from his vantage point among the fixed stars, called "the little threshing-floor that makes us so fierce."[3] The attribution of life or angelic influence to celestial spheres did not hinder a mechanical interpretation of their movement, however. Quite the opposite was the case. After all, Aristotle had his God-like motors working in a give-and-take system of contact force. The benefit of using orbs and spheres, to which the luminous bodies attached, was that they behaved

1 Ghent University, Department of Philosophy and Moral Sciences, Sarton Centre for History of Science. I would like to thank Justin Smith for his invitation to contribute a reflection to the present volume, as well as Patrick Boner for his comments.

2 Edward Grant, *Planets, Stars, & Orbs: The Medieval Cosmos, 1200–1687* (Cambridge, UK: Cambridge University Press, 1994), 469–487.

3 Dante, *The Divine Comedy*, trans. John D. Sinclair (Oxford: Oxford University Press, 1961), 325.

in ways resembling machines, calculating instruments, and mathematical diagrams. It is often said that Nicole Oresme (*c.* 1320–1382), professor at the medieval University of Paris, was among the first to compare the skies to a mechanical clock.[4] But he also considered angelic will responsible for the impulsion and resistance within the mechanism. This is a reasonable position vis-a-vis Scholastic theology, in which angelic power was precisely calibrated by God. Shortly before Oresme's birth, Dante (1265–1321) had written of his voyage to the sphere of the sun. There, he had met past theologians, their fiery souls arranged in a "glorious wheel" that spun *come orologio*, "like a clock . . . when one part draws or drives another, sounding the chime with notes so sweet that the well-ordered spirit swells with love . . . "[5]

The history of the skies is a history of embodiment. What is embodied is some formal principle or influence that can generate orderly movement. From the late seventeenth century onward, the skies would manifest the mathematical perfection of Newtonian law. Celestial objects, like all objects, embodied a cohesive force operating instantaneously across a passive space: gravity. It might be said that in modern physics space-time itself embodies gravity, curving and swirling according to the field equations of general relativity. Celestial embodiment provides, and has provided since the Greeks, an assurance and explanation of mathematical order. This fact disproves what is still a commonplace in the history of science: that the mathematization of the world went hand in hand with its sterilization. Instead, until the seventeenth century, celestial regularity was usually the sign of embodied intelligence, soul, and knowledge. As solid sphere mechanisms became more

4 Nicole Oresme, *Le livre du ciel et du monde*, ed. Albert D. Menut and Alexander J. Denomy, trans. Albert D. Menut (Madison: University of Wisconsin Press, 1968), 288, 71a.

5 Dante, *The Divine Comedy*, 153–155.

and more untenable in the sixteenth century, celestial souls filled the explanatory void.[6] In the absence of spheres, a living planet could propel itself with sufficient neatness. The innovators of sixteenth-century cosmology— Julius Caesar Scaliger (1484–1558), Girolamo Cardano (1501–1576), Bernardino Telesio (1509–1588), Francesco Patrizi (1529–1597), William Gilbert (1544–1603), Tycho Brahe (1546–1601), Giordano Bruno (1548–1600), and Johannes Kepler (1571–1630)—were almost all in agreement that planetary movement was a kind of animal movement (whether or not they held to solid spheres). Planetary souls were frequently cast as intelligent—they had to be, in order to follow their invisible courses through the wide celestial plains.[7] Both Brahe and Gilbert suggest that planets have an inborn "*scientia*."[8]

The role of medical ideas in the sixteenth-century vision of the world is particularly fascinating. Physicians were behind many of the century's most widely read works of natural philosophy. Humanist medicine was likewise a point of convergence for non-Aristotelian currents—Stoic, Paracelsian, and Platonic in the mold of Marsilio Ficino (1433–1499).[9] As planets became animal, they

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6 For an introduction to sixteenth-century cosmological innovation, see Miguel A. Granada, "New Visions of the Cosmos," in *The Cambridge Companion to Renaissance Philosophy* (Cambridge, UK: Cambridge University Press, 2007), 270–286.

7 "[. . .] that heaven and earth and the watery plains [. . .] a spirit within sustains; in all the limbs mind moves the mass and mingles with the mighty frame." Virgil, *Ecologues, Georgics, Aeneid I-VI*, trans. H. Rushton Fairclough, Loeb Classical Library (London: William Heinemann, 1916), 556–557 (bk. 6, ln. 724–752).

8 See William Gilbert, *De magnete . . .* (London: Peter Short, 1600), 210. As Brahe writes in the *De mundi aetherei recentioribus phaenomenis liber secundus* (Uraniborg, 1588), "The celestial machine is not a hard and impenetrable body, crammed full of various real orbs, as was heretofore believed by most people. On the contrary, very fluid and quite simple, it lies open everywhere, without exertion or transportation by any real spheres, to the unimpeded revolutions of the planets, governed by divinely implanted knowledge [*iuxta diuinitus inditam Scientiam administratis*], while heaven offers absolutely no obstacle." Translation in Edward Rosen, "The Dissolution of the Solid Celestial Spheres," *Journal of the History of Ideas* 46, no. 1 (March 1985): 13–31, 22.

9 For the medical humanists of the sixteenth century, see Hiro Hirai, *Medical Humanism and Natural Philosophy: Renaissance Debates on Matter, Life and the Soul*, Medieval and Early Modern Science 17 (Leiden, The Netherlands: Brill, 2011).

became subject to medical and physiological considerations. The outstanding astronomers and celestial theorists were trained or at least well read in medicine, and sensitive to new causalities of body. Gilbert, for example, was a *medicus* by profession. He was physician to Queen Elizabeth when his seminal work on magnets, the *De magnete*, was published in 1600. It is not surprising that he describes the earth's diurnal rotation as an affair of health. If the earth were immobile, it would suffer burns on one side and frigidity on the other: "[Earth] would not choose to endure this so miserable and horrid appearance on both her faces," he writes.[10] For Gilbert, as for his Copernican contemporaries Bruno and Kepler, the planetary body is clearly a physiological body, caring for itself and avoiding pain. Gilbert's metallurgy relies on an important late-Renaissance motif: the earth as a womb or matrix for seeds. Metal formation in the *De magnete* is explained, in detail, by humors flowing through the body of the earth. These humors are the proximate cause of metals, "like the blood and semen in the generation of animals."[11] It should also be noted, given the humanist environment in which new cosmologies flourished, that Gilbert's theory of the earth has strong classical roots in Cicero and Seneca.[12]

For Kepler, who carefully studied the *De magnete*, celestial bodies are very large animals.[13] The philosophical astronomer is tasked

10 William Gilbert, *On the Magnet (De magnete)*, trans. Silvanus Phillips Thompson (New York: Basic Books, 1958), 224.

11 Ibid., 20–21.

12 See Cicero in *De natura deorum*, II.33, where he writes of the earth's womb and formative powers, or Seneca in *Naturales quaestiones*, III.15: "Now, in us there is not just blood but many kinds of fluid, some essential, some corrupted and rather too thick; in the head there is the brain, mucus, saliva, and tears; in the bones, marrow and something added to the joints as a lubricant so that they can bend more readily. In just the same way in the earth as well there are several kinds of fluid: some that harden when fully developed (from them comes the entire harvest of metals—from which greed seeks out gold and silver—and substances that turn from liquid to stone), and some that are formed from the decay of earth and moisture (such as bitumen and other things of that sort)." Seneca, *Natural Questions*, trans. Harry M. Hine (Chicago: University of Chicago Press, 2010), 34.

13 For Kepler's vitalism, see Patrick J. Boner, *Kepler's Cosmological Synthesis: Astrology, Mechanism and the Soul*. History of Science and Medicine Library 39 (Leiden, The Netherlands: Brill, 2013).

with studying their faculties—that is, their forces and productions. It helps that all created souls are essentially geometrical, because they can be assured to behave according to certain special proportions. In that sense, Kepler uses the celestial soul as most natural philosophers before him had used it, as a motor of force and mathematical order.[14] However, his celestial bodies possess a startling vitality. The earth puts out hair, perspires, gets angry, suffers digestive problems, breathes, imagines, and enjoys an intense sexual relationship with the sun (following an astrological-humanist motif present in Copernicus). For Kepler, this relationship is marked by an actual collaboration of penetration and reception mediated by light. Celestial sex is not only good and useful in Kepler's description, but deeply pleasurable.[15] It is, he says, another sign that the earth must possess a sensitive soul. The celestial plains also teem with generation. When pockets of celestial aether become dense and cloudy, the world soul triggers a natural process of purification. From this process, celestial novelties are born: new stars, comets, blood-red fogs. Kepler explains comets as the body's treatment of diseased matter: "Thus from this collected fatness of aether, as from excrement in a sort of abscess, [a comet] is made from the nature of its location . . . "[16] Indeed, the putrid vapor sprayed from a comet's tail can strike our terrestrial air, causing pestilence.[17] This circulation of bodily causes and the penetrability of boundaries are the hallmarks of Kepler's account of celestial generation, and here he echoes dominant

14 See Jonathan Regier, "Kepler's Theory of Force and His Medical Sources," *Early Science and Medicine* 19, no. 1 (March 26, 2014): 1–27.

15 Kepler, *Gesammelte Werke*, vi, 266. Johannes Kepler, *Harmony of the World*, trans. E. J. Aiton, A. M. Duncan, and J. V. Field (Philadelphia: American Philosophical Society, 1997), 360.

16 "Coacta igitur illa crassa pinguedine aetheris quasi quodam excremento, velut in quoddam Apostema: fit ex natura loci [. . .]" Johannes Kepler, *Gesammelte Werke*, ed. Walther von Dyck et al. (Munich: C.H. Beck, 1937–), viii, 225.

17 "But what if we mingle the Aristotelian opinion of the tail with the more recent one, so that some luminous matter really does exhale from the head [. . .]? Then if the tail were to touch the

sixteenth-century views on health, sickness and living bodies. Michael Stolberg has written that the early modern body was characterized by permeability, determined by the flow of fluid and humor instead of behavior in its solid parts.[18] Health and disease became an affair of "fluids, wind, and vapors" moving within a body "virtually uninhibited by any anatomical boundaries."[19]

Although it is frequently written that the sublunar and supralunar regions were utterly distinct in Aristotelian philosophy, this was never completely true. The medieval period was in general agreement about generative (and sometimes destructive) virtues being transmitted from the heavens to the sublunar realm. This attitude was largely the result of Greek and Arabic commentators trying to patch up Aristotle's theory of celestial-terrestrial causality. As the ontological gap between celestial and terrestrial was closed in the sixteenth century, the skies maintained their generative function. For most celestial innovators, space was filled with an informing *pneuma, spiritus*, light, or heat. Which brings us to a fascinating historical observation: uniform space, in its late-Renaissance incarnation, was a nourishing and formative entity. In other words, the ambient served as an incubator and instigator of local, determined bodies, rather as the flow of bodily spirits and humors fed diverse organs and faculties.

In guise of a conclusion, we might offer that it became philosophically useful in the sixteenth century to think of the celestial region not only as animate but as animal. Celestial phenomena could be explained by way of physiological processes observed in animal bodies. This shift put the focus on the faculties

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earth, no wonder that the air be infected by a poisonous influence." Kepler, *Gesammelte Werke*, ii, 233. Translation in Johannes Kepler, *Optics: Paralipomena to Witelo, & Optical Part of Astronomy*, trans. William H. Donahue (Sante Fe, NM: Green Lion Press, 2000), 278.

18 Michael Stolberg, *Experiencing Illness and the Sick Body in Early Modern Europe*, trans. Leonhard Unglaub and Logan Kennedy (New York: Palgrave Macmillan, 2011), 83.

19 Ibid., 126.

and forces exhibited by these bodies, which could be thought of as composed of uniform matter organized by similar vital causes. It is very likely that those principles foundational to classical physics—uniformity of space, matter, force—owe a tremendous debt to vital natural philosophies of the late Renaissance. Well before mechanist philosophies dominated, nature had in some instances already become uniform. Uniform but not sterilized: because if the Baroque is marked by the *pli*, as Deleuze thought it was,[20] the sixteenth and early seventeenth centuries are marked by fluids of quarry, crucible, butcher, hospital, by what flows, by what folds in on itself in rivulets of varied density, by what expands flame-like, by what coagulates and clumps, by what boils and cools.

20 Gilles Deleuze, *Le pli: Leibniz et le baroque* (Paris: Les Éditions de Minuit, 1988).