

The great Copernican cliché

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For more than three centuries scientists, historians, and popularizers of science have been repeating the claim that Copernicus “dethroned” earth from its “privileged” central position in the universe. However, a survey of pre-Copernican natural philosophy (which viewed the earth as located in a cosmic sump) and of Copernicans’ own account of the axiological meaning of the new heliocentric astronomy (which exalted earth to the dance of the stars) demonstrates that the cliché about earth’s “demotion” is unwarranted and fit to be discarded. © 2001 American Association of Physics Teachers.
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I. INTRODUCTION: THE NEED FOR JANITORIAL WORK

The main concern of this paper is the kind of thing that happens to some perfectly good physical theory when it is interpreted, either by experts or by popularizers, in an unrigorous or uninformed manner to mean something that it does not mean. A familiar example of this phenomenon is how Einsteinian relativity theory is seized on by those who wish, in whatever realm—moral, psychological, or even physical—to support the claim that “everything is relative.” Richard Feynman, to mention only one stellar example, has dealt dryly and decisively with what he calls the “cocktail-party philosophers” who promote this interpretation of relativity. There is “nothing deeper in most of the philosophy which is said to have come from the theory of relativity,” asserts Feynman, “than the remark that ‘A person looks different from the front than from the back;’” however, in fact, as far as physics is concerned, “it is not true that ‘all is relative.’”¹

In a similar manner I would like to invite scrutiny—and, ultimately, rejection—of what I will argue is a nontrivially erroneous interpretation of another, much earlier development in physics and cosmology: the Copernican revolution. In doing so I shall be attempting, in my function as an intellectual historian, to perform a bit of janitorial work that I hope may be of use to the community of physicists and beyond. In short, I shall try to *begin* to sweep away what I call the great Copernican cliché, which for a good number of years, even centuries, has been cluttering up our understanding of the history of astronomy, and of history generally.

In its most popular form, the erroneous claim I wish to tackle often appears side-by-side with yet another one that I will mention just in passing, and only with reference to its expression beyond scientific circles. In the 1997 Hollywood science-fiction movie called *Men in Black*, the main character, Agent Kay, who is leading humanity’s attempt to defend itself against “the scum of the universe,” at one point tries to chart human progress by declaring that 500 years ago everyone thought (1) that the earth was flat, and (2) that we were the center of the universe.

The first of these two claims is really very easy to dispose of—*pace* George and Ira Gershwin, who wrote, in a popular song, “They all laughed at Christopher Columbus / When he said that the world was round.” In fact I do not doubt that some of Columbus’s contemporaries might have thought that the earth was flat. On the other hand, I’d lay even odds that within a 10 mile radius of where you live you could find

someone who believes in a flat earth. If we’re comparing educated people with educated people, however, we can readily show how Aristotle in the fourth century B.C. taught that the earth is spherical, and how Eratosthenes at the beginning of the second century B.C. devised a method for calculating, pretty accurately, the circumference of the spherical earth.²

But that second claim of Agent Kay in *Men in Black*, the one about us no longer “being the center of the universe,” will take a little more effort to put into the dumpster—and a little more time—simply because it is still so firmly attached to ordinary, respectable, even reputedly scientific ways of thinking about the history of astronomy.

Let me invite a moment of reflection: How often have you heard or read that Copernicus *dethroned* humankind by removing earth from the center of the universe? It is a claim that one hears not only in Hollywood B-movies but also from more scientifically reputable sources. Most high school science texts seem to say so, as do many university-level “Astronomy 101” syllabuses.³ Anyone writing on the history of science as it relates to human value seems obliged to say so, including prominent scientists who authoritatively interpret that history for a wider public. In 1973, in one of a series of public lectures marking the 500th anniversary of Copernicus’s birth, Theodosius Dobzhansky declared that, with Copernicus, the earth was “dethroned from its presumed centrality and preeminence.”⁴ Perhaps most famously of all, Carl Sagan described Copernicanism as the first in a series of “Great Demotions ... delivered to human pride.”⁵ And the same general claim continues to be repeated year by year, whether in popular accounts or in the writings of the most learned scientists, as for example in the pronouncement of Britain’s Astronomer Royal, Sir Martin Rees: “It is over 400 years since Copernicus dethroned the Earth from the privileged position that Ptolemy’s cosmology accorded it.”⁶ Late in 1999, amid the pseudo-millennial exuberance that engulfed the closing days of that year, the then-Chair of the Historical Astronomy Division of the American Astronomical Society was asked to nominate a “Top Ten” list of Astronomical Triumphs of the Millennium—and placed at #3 spot the following:

We are not the center of the

SOLAR SYSTEM (Copernicus, 1500) ...

UNIVERSE (Digges [1576])⁷

To complete this miscellaneous sampling, I share an instance that caused me particular dismay. In October of 2000, *Sky &*

Telescope published a review of my own anthology, *The Book of the Cosmos*. The review was illustrated with the famous heliocentric diagram from Copernicus's *De revolutionibus orbium caelestium*, accompanied by a caption provided by the magazine's editors. Copernicus, the caption stated (in part echoing Sagan), "was the first to push humankind off its pedestal of being the center of the universe. Such a celestial demotion did not go over well in religious circles."⁸

My purpose in citing all these examples—by people whom I hold in high regard—is to illustrate the sheer pervasiveness of the great Copernican cliché, which has been repeated so often, and by such respectable voices, that it is now virtually a part of everyone's mental furniture. That, of course, is the nature of a cliché: It is a statement whose very frequency of repetition results, independent of its truth or falsehood, in its being repeated yet again. As this definition concedes, not all clichés are necessarily false. However, my janitorial task here is to try to clear away a cliché that *is* false—and, I believe, harmful. The job will divide itself into three main shifts: (1) an explication of the nature, terms, and assumptions of the cliché itself; (2) an examination of some of the features of pre-Copernican physics and cosmology, with illustrations of how they have been misrepresented or misunderstood; and (3) an overview of how Copernicans' own conception of their accomplishments runs counter to more modern interpretations of the meaning of Copernicanism. These will be followed by further reflections on the cliché's origin and future. My assumption in attempting these tasks is that, if professional physicists and astronomers can be made aware of the fallacy of the cliché, then its days may be numbered.⁹

II. THE NATURE OF THE CLICHÉ

The great Copernican cliché is premised upon an uncritical equation of *geocentrism* with *anthropocentrism*. It presumes that, by removing earth from a physically and geometrically central location in the universe, Copernicus removed humankind (*anthropos*), inhabitant of this earth, from its *metaphysically* central place in the cosmos.

We shall be assisted in observing the distinction between geocentrism and anthropocentrism if we likewise carefully distinguish between *literal* and *figurative*. For example, we are already speaking figuratively when we say that Copernicus removed earth from the center of the universe—for, literally, earth wasn't there to start with, and, whatever earth's location, Copernicus didn't actually move it! In some respects, of course, this trope is innocent enough, and I'm not objecting in principle to figurative language. But as I'll try to show shortly, we risk serious confusion unless we exercise caution in moving from the literal to the figurative. Geocentrism is primarily a term of *literal* denotation: Ptolemy's cosmology is called geocentric because he thought that the earth stood literally, geometrically, at or in the center. But *anthropocentrism*—like *ethnocentrism* and *eurocentrism*—is a term whose primary denotation is figurative and axiological: To call an American eurocentric is to say that his or her value system is culturally "centered on" that of Europe (whatever that might mean). The first time I ever visited London, England, I was given a tour by a proud Londoner who pointed out Piccadilly Circus to me and announced: "And *that* is the center of the universe." He was, with full

awareness, speaking figuratively, and was making, perhaps with a touch of self-irony, a statement about the *importance* of the place.

Now, in underlining this distinction, I am not of course denying that a geocentrist *might* also be an anthropocentrist. I'm simply making the crucial preliminary point that literal and figurative meanings don't necessarily coincide, and that a critical understanding of the history of geocentrism, as well as of the rejection of geocentrism, ought to begin by observing the difference. At a subsequent stage of my argument I shall support the further claim that, for most pre-Copernican philosophical and astronomical authorities, geocentrism did not in fact entail or even accompany claims about earth's or humankind's preeminent importance.

In short, the great preponderance of evidence I have examined suggests that the equation of pre- and anti-Copernican *geocentrism* with *anthropocentrism*, in spite of how frequently it continues to be reasserted, is historically, philosophically, and scientifically untenable. There neither is, nor in the unfolding of Copernicanism has there ever been, any necessary correlation between literal, geometric centrality and "centrality" in the figurative sense of "importance" or "prominence." The affirmation of one does not entail an affirmation of the other, nor does the *denial* of one entail a denial of the other.

III. ARISTOTLE'S PHYSICS AND THE MEANING OF EARTH'S LOCATION

Before turning to Copernicus and his immediate heirs, let us briefly review some of the assumptions upon which Ptolemaic, pre-Copernican cosmology rested. A glance at one aspect of Aristotelian physics will lead us immediately to another distinction that modern interpreters often fail to observe.

I have already illustrated from *Sky & Telescope* and the *H.A.D. News* how we tend to drop the preposition "at" or "in" when describing geocentrism: We say, "for Ptolemy, earth *was* the center of the universe." I'm not just splitting hairs here. Technically, Aristotle and Ptolemy did *not* believe that earth "*was* the center of the universe." Rather, the universe *had* a centerpoint; and earth (*per accidens*, as Aristotle might have said, had he spoken Latin) was so located that *its* centerpoint coincided with *the universe's* centerpoint.¹⁰ It is quite understandable that we should ignore this distinction or feel that it is merely trivial, given our tendency to read Newton back into pre-Newtonian physics. For Newton—and also, indirectly, for Einstein—it *is* the earth, the mass, that draws objects towards its own center. But for Aristotle, the tendency of heavy things to fall down resulted not from the location of a certain mass but rather from the influence of the location itself, in this case the central location—and I mean not the center of the earth as such but the center, *period*. It is that central *place* itself, not a massive body, that draws heavy things to itself. As Aristotle says in Book 4 of the *Physics*, place itself "exerts a certain influence."¹¹ And it is merely the fact that earth is composed of the heaviest element (earth being heavier than the other three: water, air, and fire, in that order) that explains why the body on which we live is motionless *in* the center of the universe. In this sense, then, very strictly speaking, we shouldn't even call the Aristotelian/Ptolemaic cosmology "geocentric," but rather something like "centro-centric," though I have no great expectation that this term will catch on.

Aristotle's literal, physical explanation for why earth is *at* or *in* the center of the universe has profound consequences, consequences that almost uniformly run counter to the interpretations implied by the great Copernican cliché as it has been disseminated throughout histories of western cosmology since the late 17th century. In most medieval interpretations of Aristotle's and Ptolemy's cosmology, earth's position at the center of the universe was taken as evidence not of its importance but (to use a term still in circulation) its grossness.¹² One of the clearest expositions of this idea is found in the writings of the great Jewish philosopher Moses Maimonides (1135–1204). After drawing various parallels between the universe as a whole and an individual body, Maimonides nevertheless cautions that there are differences that undermine any simple analogy between macrocosm and microcosm. One of these differences relates to the place and importance of the center.

Living creatures endowed with a heart have it within the body and in the midst thereof; there it is surrounded by organs which it governs. Thus it derives a benefit from them, for they guard and protect it *The reverse occurs in the case of the Universe.* The superior part encompasses the inferior parts While it influences all that is contained within, it is not influenced by any act or force of any material being. There is, however, some similarity [between the universe and man] in this point. In the body of animals, the organs more distant from the principal organ are of less importance than those nearer to it. Also in the universe, *the nearer the parts are to the centre, the greater is their turbidness, their solidity, their inertness, their dimness and darkness,* because they are further away from the loftiest element, from the source of light and brightness, which moves by itself and the substance of which is the most rarefied and simplest: from the outermost sphere. At the same ratio at which a body is nearer this sphere, it derives properties from it, and rises above the spheres below it.¹³

This view of our place in the universe undergirds Maimonides' subsequent warning in the same work that we must not "think that the spheres and the angels were created for our sake" (p. 276). In the earlier words of Proclus (412–485), "man is ... a 'being of farness': 'living at the end of the Whole, and farthest from them (i.e., real things), we have a gross and defectuous perception.'"¹⁴

A fuller survey of ancient and medieval Arabic, Jewish, and Christian thought—for which there is insufficient space here—would reinforce this axiological dimension of cosmology. *Upward* is the direction of improvement and rising importance (within Christianity, for example, Heaven is *up*; Christ *rises* from death and into Heaven; the spirits of the devout are *exalted*—literally, "lifted high"—and so on). By contrast, *downward*, toward the center, is the direction of deterioration, corruption, and the grave. In this sense, as Martianus Capella (fl. 410–439) points out in his cosmological writings, earth is "in the middle *and at the bottom*" position in the universe.¹⁵ As the Arab geographer Al-Biruni (973–1048) states, "in the centre of the sphere of the moon is the earth, and this centre is in reality the lowest part."¹⁶ Thomas Aquinas, the greatest of medieval Christian philosophers, declares that, "in the universe, earth—that all the

spheres encircle and that, as for place, lies in the center—is the most material and coarsest (*ignobilissima*) of all bodies."¹⁷ Moreover, based on a consistent extrapolation from this view, the Middle Ages conceived of hell as being located at the *very* center, and therefore coincident with the center of earth. In Dante's *Divine Comedy*, accordingly, we find the Inferno, hell itself, in the earth's inmost core, at the very midpoint of which, in keeping with Aristotelian physics as well as with poetic justice, appears Satan: not dancing in flames—for the element of fire belongs in another place—but frozen, immobile, in ice.¹⁸

To summarize, pre-Copernican cosmology pointed not to the metaphysical or axiological "centrality" but rather to the sheer grossness of humankind and its abode. In this view, the earth appears as a universal pit, figuratively as well as literally the world's low point. As C. S. Lewis puts it, the medieval model is in fact not anthropocentric but "anthropoperipheral."¹⁹ This negative view encompasses, finally, not only ancient and medieval Arabic, Jewish, and Christian writers, but also many prominent voices that we usually associate with Renaissance humanism, both before and after the time of Copernicus. Giovanni Pico (1463–1494), even within a work that acquired the title *Oration on the Dignity of Man* (1486), refers to our present dwelling place the earth as "the excrementary and filthy parts of the lower world."²⁰ And a quarter century after the publication of *De revolutionibus*, in 1568, Michel de Montaigne takes up the same theme once more, declaring that we are "lodged here in the dirt and filth of the world, nailed and rivetted to the worst and dearest part of the universe, in the lowest story of the house, and most remote from the heavenly arch."²¹

But what do we discover when we turn from this rich and thickly woven background to the work of 20th century historians of science? How surprised might Pico and Montaigne be to read Morris Kline's confident declaration that one of the "prevailing doctrines of Christianity" in the time of Copernicus and Kepler was the "comforting dogma" "that man was at the center of the universe; ...the chief concern of God," and "chief actor on the central stage."²² Can we avoid the conclusion that what truly appears as the prevalent view in the Middle Ages and beyond, of this earth as "the excrementary and filthy parts of the lower world," flatly contradicts the now-standard assertions of Kline and so many others who perpetuate this great Copernican cliché? Before pressing this conclusion, however, let us consider some of the Copernicans themselves.

IV. COPERNICANISM AND THE EXALTATION OF THE EARTH

In contrast with Maimonides, Dante, and Pico, Copernicus himself may be seen as "exalting" the position of humankind in the universe. Most famously, in the letter to Pope Paul III with which he opens *De revolutionibus*, Copernicus tells how "it began to irritate me that the philosophers ... could not agree on a more reliable theory concerning the motions of the system of the universe, which the best and most orderly Artist of all framed for our sake [*propter nos*]."²³ As Fernand Hallyn comments in his study of Copernicus and Kepler, "if man is the beneficiary of the world, his profound 'centrality' remains, wherever he is physically located. ... Copernicus' universe ... remains from this perspective profoundly anthropocentric."²⁴ The contrast with Maimonides' warning more than 300 years earlier not to "think

that the spheres and the angels were created for our sake” could hardly be clearer. Over the past century a handful of other scholars have in their own ways drawn attention to medieval geocentrism’s non-anthropocentric character or to anthropocentric tendencies within Copernicanism,²⁵ but their arguments, however robust, have apparently simply not registered in either the popular or the scholarly scientific mind.

So let us examine Copernicanism’s exaltation of us and our earth against the backdrop of medieval assumptions that I have already sketched—assumptions whereby we find ourselves in a sort of cosmic sump here in the center of the universe. If we probe the textual record of Copernicanism, we can see what both it and its opponents took to be their ideas’ axiological implications for the issue of our cosmic location. Consider first the famous 1536 letter by Nicholas Schönberg that prefixes the *De revolutionibus*, in which he encouraged Copernicus to communicate his cosmology to other scholars. In Copernicus’s cosmology, Schönberg summarizes, “the sun occupies the lowest, and thus the central, place in the universe.”²⁶ The logic of this phrase is significant: Note that the place occupied by the sun is *lowest*, and therefore central, not the other way around. We may also speculate that Copernicus might thus have felt a considerable degree of awkwardness, initially, in placing the sun in this low location previously occupied by the lowly earth—and even perhaps that he is compensating for this apparent demotion of the sun when, in his famous “hymn,” he so poetically (but also with an appeal to practicality) describes the restationing:

And behold, in the midst of all resides the sun. For who, in this most beautiful temple, would set this lamp in another or a better place, whence to illuminate all things at once? For aptly indeed do some call him the lantern—and others the mind or the ruler—of the universe. Hermes Trismegistus calls him the visible god, and Sophocles’ Electra “the beholder” of all things. Truly indeed does the sun, as if seated upon a royal throne, govern his family of planets as they circle about him.²⁷

My own suspicion is that this strenuous revaluing and refurbishing of the center, complete with “royal throne” (N.B. the serious play on words: “tanquam in *solio* regali *Sol* residens ...”), was such a dazzling success that we have ever since been blinded to how Copernicus’s predecessors truly viewed the central location.

Consider another letter, one about Galileo written by Cardinal Bellarmine in 1615, almost 80 years later than Schönberg’s. Bellarmine addresses the familiar issue of whether the Bible itself dictates a geocentric view. But looking beyond that issue and, keeping in mind geocentrism’s evident uncomplimentary implications for the status of the earth, we notice how these infuse Bellarmine’s language. Both the Church Fathers and the modern commentators on Scripture, Bellarmine says, agree “in the literal interpretation that the sun is in heaven and turns around the earth with great speed, and that the earth is *very far from heaven* and sits motionless at the center of the world.”²⁸ Surely “very far from heaven” is a long way from conjuring up any picture of a throne or a pedestal! Similar language is echoed by Galileo in what appears to be his response to Bellarmine. Here Galileo supports a less literalistic reading: “In regard to placing the sun in heaven and the earth *outside it*, as Scripture seems to affirm,

etc., this truly seems to me to be a simple perception of ours and a manner of speaking only for our convenience.”²⁹

From this and other such correspondence, it is clear that Galileo is interested in overthrowing not Scripture itself but rather a hidebound Aristotelian interpretation of it. And one of the things about that interpretation that he undermines is precisely the uncomplimentary and cosmically isolated status that Aristotle and the followers of Ptolemy ascribe to the earth. By contrast, Galileo’s version of Copernicanism *promotes* earth and its inhabitants to a role of participation and reciprocity within the cosmic scheme. For example, in *Sidereus Nuncius* (1610) Galileo explicitly presents his account of earthshine—of how the earth sends light to the moon just as the moon shines upon the earth—as entailing community and commerce between these two heavenly bodies, as indeed between two stars: “The earth, with fair and grateful exchange, pays back to the moon an illumination like that which it receives from the moon.”³⁰ Furthermore, Galileo writes, this account militates against “those who assert, principally on the grounds that it has neither motion nor light, that the earth must be excluded from the dance of the stars. For ... the earth does have motion, ... it surpasses the moon in brightness, and ... it is not the sump where the universe’s filth and ephemera collect.”³¹

The same idea is repeated with great force and clarity more than 20 years later in Galileo’s *Dialogo*, in which his spokesman Salviati declares: “As for the earth, we seek ... to enoble and perfect it when we strive to make it like the celestial bodies, and, as it were, place it in heaven, from whence your philosophers have banished it.”³² “Your philosophers,” in this case, of course, are the sorts of Ptolemaic astronomers who, according to the almost unanimous account of historians of science for at least the past century, placed earth “on a pedestal” at the center of the world. However, contrary to the oft-repeated claim that ancient and medieval *geocentrism* placed the earth and humankind in a position of supreme or privileged importance in the universe, it is *heliocentrism*, the new cosmology of Copernicus, that truly construes the place of humankind as one of prominence. In Ptolemaic cosmology, the place of earth is both low and lowly. But, in contrast, the cosmology of Copernicus and Galileo is, in more senses than one, *uppity*.

Kepler’s views are likewise strikingly anthropocentric. For Kepler, the center position would be downright dull—and I don’t mean just lacking in luminosity. He argues that, because “man” was created for contemplation, “and adorned and equipped with eyes, he could not remain at rest in the center. On the contrary, he must make an annual journey on this boat, which is our earth, to perform his observations. ... There is no globe nobler or more suitable for man than the earth. For, in the first place, it is *exactly in the middle* of the principal globes ... Above it are Mars, Jupiter, and Saturn. Within the embrace of its orbit run Venus and Mercury, while at the center the sun rotates.”³³ This is clearly a complete reconceptualization of what it means to be in the center. To exercise or actualize their divine image properly, humans must be able to observe the universe from a “central” but dynamic and changing point of view conveniently provided by what Kepler sees as this optimally placed orbiting space station of ours. And for him, therefore, only with the *abolition* of geocentrism may we truly say that we occupy the best, most privileged place in the universe. Indeed, so convinced was Kepler of the superiority of humankind’s station here on earth that, charmingly, he expressed a certain pity for

those (he thought) who dwell on Jupiter, and theorizes that, in the divine plan, the Jovians, so that they won't feel *too* envious of us earth-dwellers, are granted a few extra moons by way of compensation: "Let the Jovian creatures, therefore, have something with which to console themselves. Let them even have ... their own four planets."³⁴

So again the question arises: How does what Copernicans and pre-Copernicans actually wrote square with the pronouncements of modern commentators? Where does it leave the repeated claim (in the approving words of Sigmund Freud) about that "outrage" against humankind's "naive self-love" which we associate with "the name of Copernicus?"³⁵ How does it harmonize with the same tale as told more recently by Carl Sagan and again by Terrence Deacon, who says that "Since Copernicus first suggested that Terra Firma might not be located in the center of the cosmos, most of the remaining vestiges of human specialness have come into doubt?"³⁶ I suggest that Copernicus and Galileo and Kepler themselves, if we but read them, undercut the fundamental assumption of such pronouncements, either that central location equates with human specialness, or that loss of central location equates with loss of human specialness.

V. ORIGINS OF THE CLICHÉ

If so many prominent medieval authors and such authoritative early modern spokespeople for heliocentrism undermine that equation of geocentrism and anthropocentrism—and if Copernicanism creates the exhilarating prospect of our species inhabiting a star, a planet, a place no longer "excluded from the dance of the stars"—then how did the great Copernican cliché arise? I do not yet have any definitive answer to this question. It is much easier to expose factual error than to account for motivation. I have no doubt that, for many, the exhilaration translated into bewilderment. One thinks of John Donne's oft-quoted lament, "'Tis all in pieces, all coherence gone;" or Pascal's "The eternal silence of these infinite spaces frightens me;" or Robert Burton's humorous but frustrated roundup of the cosmologists of his day: "the world is tossed in a blanket amongst them, they hoist the earth up and down like a ball."³⁷ Moreover, perhaps bewilderment and loss of security have been interpreted, understandably, as loss of specialness.³⁸ But it is worth pointing out that the security, even coziness, of the medieval universe (of which there were varying versions), does not by itself justify our reading human haughtiness or vanity into that cosmology. One can be cozy in a humble basement suite. An acquaintance recently told me the story of his small family moving out of such a dwelling and into a new spacious house. And he recounted how he had wept, because that little suite had been so filled with joy and had played such an important role in the unfolding of his marriage and of his young family's life together.

I am also not yet able to pinpoint exactly *when* the cliché first appeared, though I would venture that it arose some time in the decades after 1640. In that year John Wilkins, perhaps the greatest English apologist for Copernicanism in the mid-17th century, explicitly acknowledges that heliocentrism stands in opposition to those geocentrists who argue from the premise that the central position is the universe's worst location:

The second sort of arguments taken from natural philosophy, are principally these three.

(1) First, from the vileness of our earth, because it consists of a more sordid and base matter than any other part of the world; and therefore must be situated in the centre, which is the worst place, and at the greatest distance from those purer incorruptible bodies, the heavens.

I answer: this argument does suppose such propositions for grounds, which are not yet proved, and therefore not to be granted as

- (1) That bodies must be as far distant in places, as in nobility.
- (2) That the earth is of a more ignoble substance than any other planets, consisting of a more base and vile matter.
- (3) That the center is the worst place.

All of which are (if not evidently false) yet very uncertain.³⁹

However, by the mid-1650s or shortly thereafter, some writers can indeed be found associating geocentrism with human self-importance. Among these are Cyrano de Bergerac, who protests "the insufferable pride of humans," and Thomas Burnet, who as it were retaliates by referring to our earth as an "obscure and sordid particle."⁴⁰ But it is the great French popularizer of Copernicanism Bernard le Bouvier de Fontenelle who most powerfully asserts the negative axiological implications of the new cosmology: In his famous *Entretiens sur la Pluralité des Mondes*, the lady in the dialogue, upon hearing about the heliocentric model, declares that Copernicus, had he been able, would have deprived earth of the moon just as he has deprived it of all the other planets, for she perceives, she says, that he "had no great kindness for the earth." Yet Fontenelle's own character replies to the contrary by praising Copernicus: "I am extremely pleased with him ... for having humbled the vanity of mankind, who had usurped the first and best situation in the universe."⁴¹ This interpretation of Copernicanism became the standard and apparently unquestioned version of the Enlightenment, as magisterially summarized by Goethe:

Perhaps no discovery or opinion ever produced a greater effect on the human spirit than did the teaching of Copernicus. No sooner was the earth recognized as being round and self-contained, than it was obliged to relinquish the colossal privilege of being the center of the universe.⁴²

And from Goethe and the Enlightenment to the present there has been, in more senses than one, almost no looking back.

How might we account for the genesis of this interpretation and for its manifest success in driving out all others? I have already mentioned, in connection with Copernicus's hymn, my suspicion that once the center was seen as being occupied by the royal sun, that location *did* appear to be a very special place. Thus we anachronistically read the physical center's post-Copernican excellence back into the pre-Copernican world picture—and so turn it upside down. But I also suspect (though can't yet prove) that the great Copernican cliché is in some respects more than just an innocent confusion. Rather, it functions as a self-congratulatory story that materialist modernism recites to itself as a means of displacing its own hubris onto what it likes to call the "Dark Ages." When Fontenelle and his successors tell the tale, it is clear that they are making no disinterested point; they make no secret of the fact that they are "extremely pleased" with the demotion they read into the accomplishment of Copernicus. But the trick of this supposed dethronement is that, while purportedly rendering "Man" less cosmically and metaphysically important, it actually enthrones us modern

“scientific” humans in all our enlightened superiority. It declares, in effect, “*We’re truly very special because we’ve shown that we’re not so special.*” By equating anthropocentrism with the now unarguably disreputable belief in geocentrism, such modern ideology manages to treat as nugatory or naive the legitimate and burning question of whether earth or earth’s inhabitants may indeed be cosmically special. Instead it offers—if anything at all—a specialness that is cast in exclusively existential or Promethean terms, with humankind lifting itself up by its own bootstraps and heroically, though in the end pointlessly, defying the universal silence. But I am suggesting that such suppression or evasion of the larger issue of teleology ought to be recognized as lacking historical, philosophical, or scientific warrant.

Not that everyone has evaded such questions. There appear actually to be an increasing number who unapologetically carry the torch for this “rare earth,” to echo a recent prominent book title.⁴³ And for me, the words of Michael Polanyi almost half a century ago still strike a chord: Scientific “objectivity” as “exemplified by Copernican theory ... does not demand that we estimate man’s significance in the universe by the minute size of his body, by the brevity of his past history or his probable future career. It does not require that we see ourselves as a mere grain of sand in a million Saharas. ... It is not a counsel of self-effacement, but the very reverse—a call to the Pygmalion in the mind of man.”⁴⁴ Such an account of scientific objectivity, this Pygmalion in the mind, may in the end prove compatible with what some physicists and some nonphysicists would see as a quest for meaning that transcends the physical. But even at the physical level, so far Copernicanism’s reinterpretation of earth as a star need not be seen as a demotion or dethronement. As Hans Blumenberg has proposed, our “cosmic oasis”—“this miracle of an exception, our own blue planet in the midst of the disappointing celestial desert—is no longer ‘also a star,’ but rather the only one that seems to deserve this name.”⁴⁵

VI. THE FUTURE OF THE CLICHÉ

I don’t intend to conclude this paper merely by sounding an emotional or meditative note about our place in the universe, though I hope it is clear that I do think such notes are part of the cosmic melody which animates all our endeavors. I have not forgotten that my main role here is janitorial. And yet, after all, to sweep away the great Copernican cliché will require the efforts of more than just one custodian. So you could say that I have tried to assemble brooms for others to use. These include careful distinctions between literal and figurative, physical and metaphysical, geocentric and anthropocentric. They also include the simple but powerful tools we acquire when we actually read the writings of those about whom historical pronouncements are made, and when we take care not to read *back* into those writings later physical theories—as in the example of the error of seeing Aristotle’s earth as constituting a Newtonian mass. In addition, along with trying to provide some brooms, I have suggested reasons why the cliché deserves to be swept away. It nontrivially misrepresents the pre-Copernican worldview. It impedes a critical evaluation of what may be the hidden “teleology” of materialist modernism. And perhaps most corrosively, it creates the false impression that cosmology since Copernicus—or even science generally—has steadily and unambiguously demonstrated the insignificance or metaphysical “noncentrality” of human life within the universe—

when surely we must continue to address that compelling and still open question: What *is* our place within this dance of the stars?

Finally, I would like respectfully to point out that those who wish to remain adherents of the view that Copernicus “dethroned” humankind are possibly, and perhaps ironically, now in the position of those who once clung to the Aristotelian/Ptolemaic model even after having the opportunity to observe, through Galileo’s telescope, the moons of Jupiter, the phases of Venus, and the spots on the surface of the rotating sun. Such sights no doubt unsettled some deeply ingrained and very widespread ways of thinking. But, scientifically, the unsettling was not the issue; nor could the observed evidence be refuted by the mere claim that “everyone knows otherwise.” Today, it seems, “everyone knows” that Copernicanism was a demotion for humankind, a denial of earthly and human specialness in the universe. However, against this conventional view I have offered an array of disconfirming evidence. And my simple janitorial appeal to those who still cling to the great Copernican cliché is that they themselves now undertake to rescue and refurbish it, or else abandon it to the dumpster of discredited ideas.

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¹Richard P. Feynman, *Six Not-So-Easy Pieces* (Addison-Wesley/Helix Books, Reading, MA, 1997), pp. 73–76.

²See Aristotle, *Physics* 296b-297a; in *The Works of Aristotle*, edited by W. D. Ross (Clarendon, Oxford, 1930), Vol. 2; and R. Osserman’s account of Eratosthenes in Osserman, *Poetry of the Universe: A Mathematical Exploration of the Cosmos* (Anchor, New York, 1995), pp. 10–15.

³Any standard Internet search using the terms “Copernicus AND dethrone” or “Copernicus AND pedestal” will present numerous examples.

⁴Theodosius Dobzhansky, *Man’s Place in the Universe: Changing Concepts*, edited by David W. Corson (Univ. of Arizona College of Liberal Arts, Tucson, 1977), p. 80. Compare Jürgen Hamel, *Nicolaus Copernicus: Leben, Werk und Wirkung* (Spektrum Verlag, Heidelberg, 1994), p. 300: “Die ‘Entthronung’ des Menschen, die mit der Verdrängung der Erde aus der Weltmitte erfolgte, war erst der Beginn der Relativierung der Stellung des Menschen im Kosmos.”

⁵Carl Sagan, *Pale Blue Dot* (Random House, New York, 1994), p. 26.

⁶Martin Rees, *Before the Beginning* (Addison-Wesley/Helix Books, Reading, MA, 1998), p. 100.

⁷Virginia Trimble, “Astronomical Triumphs of the Millennium,” *H. A. D. News* **51**, 8–9 (2000).

⁸Richard Berendzen, “Cosmology Through the Ages,” *Sky Telesc.* **100**, 82–83 (2000).

⁹In this paper I consciously refrain from using the familiar term “Copernican principle,” simply because it admits such a range of definition. If it is used merely to imply that geometrically—either, for example, in Newtonian space or in Einsteinian spacetime—there is no unique cosmic center-point, then I have no objection to it. The great Copernican cliché, however, can be seen in part (I would argue) as involving an invalid extrapolation of this “bare” Copernican principle.

¹⁰See Galileo’s concise account of the Aristotelian view of the relationship between the center of the earth and the center of the universe: “The motion of heavy bodies is directly toward the center of the universe, and it

- happens *per accidens* that this is toward the center of the earth, because the latter coincides with the former and is united to it.” *Dialogue Concerning the Two Chief World Systems*, translated by Stillman Drake, 2nd ed. (Univ. of California, Berkeley, 1967), p. 34.
- ¹¹Aristotle, *Physics*, Book 4, p. 208b; in *The Works of Aristotle*, edited by Ross, Vol. 2.
- ¹²French intellectual historian Rémi Brague claims to have found one, only one, major medieval figure who does see geocentrism as entailing anthropocentrism, namely the Jewish theologian Saadia Gaon (882–942). However, comments Brague, this position “is utterly out of tune with the rest of the mediaeval concert.” See Brague, “Geocentrism as a Humiliation for Man,” *Medieval Encounters* 3, 187–210 (1997).
- ¹³Moses Maimonides, *The Guide for the Perplexed*, translated by M. Friedländer, 2nd ed. (Dutton, New York, 1919), pp. 118–119 (italics added).
- ¹⁴Proclus, *In Platonis Timeaeum Commentaria*, edited by E. Diehl (Teubner, Leipzig, 1903), pp. 351–352; translated and quoted in Brague, p. 198.
- ¹⁵Martianus Capella and the Seven Liberal Arts, Vol. 2, *The Marriage of Philology and Mercury*, translated by William Harris Stahl and Richard Johnson with E. L. Burge (Columbia U.P., New York, 1977), p. 318 (italics added).
- ¹⁶Al-Biruni, *The Book of Instruction in the Elements of Astrology*, translated by R. Ramsay Wright (Luzac, London, 1934), p. 45.
- ¹⁷Thomas Aquinas, *Commentary on Aristotle’s De Caelo* (1272 s.), II, xiii, 1 & xx, no. 7, in Vol. 3, p. 202b of the Leonina edition; translated and quoted by Brague, p. 202.
- ¹⁸Because ice is solid, not liquid, it is categorized in Aristotelian physics as earth, not water. The fact that Galileo’s experiments with floating pieces of ice (*Discourse on Bodies in Water*, 1612) challenged this categorization is partly what made them so controversial.
- ¹⁹C. S. Lewis, *The Discarded Image: An Introduction to Medieval and Renaissance Literature* (Cambridge U.P., Cambridge, 1964), p. 58.
- ²⁰Giovanni Pico, “Oration on the Dignity of Man,” in *The Renaissance Philosophy of Man*, edited by Ernst Cassirer *et al.* (Univ. of Chicago, Chicago, 1948), p. 224. The original phrase is “excrementarias ac foeculentas inferioris mundi partes;” *Opera Omnia Ioannis Pici* (Basel, 1493), p. 314.
- ²¹Montaigne, “An Apology of Raymond Sebond,” in *The Essays of Michel de Montaigne*, translated by Charles Cotton (Bell, London, 1892), Vol. 2, p. 134.
- ²²Morris Kline, *Mathematics: The Loss of Certainty* (Oxford U.P., New York, 1980), p. 40; *Mathematics in Western Culture* (Allen and Unwin, London, 1954), p. 117.
- ²³Nicholas Copernicus, *De Revolutionibus* (1543), excerpt as translated in *The Book of the Cosmos*, edited by Dennis R. Danielson (Perseus/Helix, Cambridge, MA, 2000), p. 106.
- ²⁴Fernand Halryn, *The Poetic Structure of the World*, translated by Donald M. Leslie (Zone, New York, 1990), p. 58.
- ²⁵See, for example, Steven Shapin, *The Scientific Revolution* (Univ. of Chicago, Chicago, 1996), p. 24; A. O. Lovejoy, *The Great Chain of Being* (Harvard U.P., Cambridge, MA, 1936), Chap. 4; and also Halryn, Polanyi, and Blumenberg in Refs. 24, 44, and 45, respectively.
- ²⁶Copernicus, *On the Revolutions*, edited by Jerzy Dobrzycki, translated by Edward Rosen (Johns Hopkins U.P., Baltimore, 1978), p. xvii. (The original phrase is: “Solem in mundi, adeoque medium locum obtinere.”)
- ²⁷Copernicus, *De revolutionibus* 1.10; excerpt as translated in *The Book of the Cosmos*, p. 117.
- ²⁸Cardinal Robert Bellarmine to Foscarini (12 April 1615), in *The Galileo Affair: A Documentary History*, edited and translated by Maurice A. Finocchiaro (Univ. of California, Berkeley, 1989), p. 68 (italics added).
- ²⁹*The Galileo Affair*, p. 84 (italics added).
- ³⁰Galileo, *Sidereus Nuncius* (Venice, 1610), folio 15r: “aequa grataque permutatione rependit Tellus parem illuminationem ipsi Lunae, quale & ipsa à Luna ... recipit.”
- ³¹*Ibid.*, folio 16r: “qui eam à Stellarum corea arcendam esse iactitant, ex eo potissimum, quod à motu, & à lumine sit vacua: vaga enim illam, ac Lunam splendore superantem, non autem sordium, mundanarumque secum sentinam, esse demonstrabimus, & naturalibus quoque rationibus sexcentis confirmabimus.”
- ³²Galileo, *Dialogue*, p. 37.
- ³³*Kepler’s Conversation with Galileo’s Sidereal Messenger* (1610), translated by Edward Rosen (Johnson Reprint, New York, 1965), p. 45 (italics added).
- ³⁴*Ibid.*, p. 46.
- ³⁵Sigmund Freud, *A General Introduction to Psycho-Analysis* (Liveright, New York, 1935), p. 252.
- ³⁶Terrence Deacon, “Giving up the Ghost: The Epic of Spiritual Emergence,” *Science & Spirit*, 10, 16–17.
- ³⁷John Donne, *An Anatomy of the World* (London, 1611); Blaise Pascal, *Pensées* (ca. 1650), from *Thoughts*, translated by W. F. Trotter (Collier, New York, 1910), p. 78; Robert Burton, *The Anatomy of Melancholy* (1638; Vintage Books, New York, 1977), second partition, p. 57.
- ³⁸Clearly the “plurality of worlds” debate and the “infiniteizing” of the universe in writers as diverse as Bruno and Newton played a major role in occasioning this kind of anxiety.
- ³⁹John Wilkins, *The Mathematical and Philosophical Works* (Cass, London, 1970), pp. 190–191.
- ⁴⁰Cyrano de Bergerac, *Les états et Empire de la lune* (Paris, 1656), and Thomas Burnet, *Telluris Theoria sacra* (London, 1681), both quoted by Paolo Rossi, “Nobility of Man and Plurality of Worlds,” in *Science, Medicine and Society in the Renaissance*, edited by Allen G. Debus (Science History, New York, 1972), Vol. 2, pp. 131–162 (pp. 151, 155).
- ⁴¹Bernard Le Bouvier de Fontenelle, *Entretiens sur la Pluralité des Mondes*, 1686; *The Theory or System of Several New Inhabited Worlds*, translated by Aphra Behn (London, 1700), p. 16.
- ⁴²Johann Wolfgang Goethe, “Materialien zur Geschichte der Farbenlehre,” in *Goethes Werke*, Hamburger Ausgabe (Christian Wegner Verlag, Hamburg, 1960), Vol. 14, p. 81: “Doch unter allen Entdeckungen und Überzeugungen möchte nichts eine größere Wirkung auf den menschlichen Geist hervorgebracht haben, als die Lehre des Kopernikus. Kaum war die Welt als rund anerkannt und in sich selbst abgeschlossen, so sollte sie auf das ungeheure Vorrecht Verzicht tun, der Mittelpunkt des Weltalls zu sein.”
- ⁴³Peter Douglas Ward and Donald Brownlee, *Rare Earth: Why Complex Life is Uncommon in the Universe* (Springer-Verlag/Copernicus, New York, 2000).
- ⁴⁴Michael Polanyi, *Personal Knowledge* (Univ. of Chicago, Chicago, 1958), p. 5.
- ⁴⁵Hans Blumenberg, *The Genesis of the Copernican World*, translated by Robert M. Wallace (MIT, Cambridge, MA, 1987), p. 685.