hermeticism indicates. It would therefore seem incumbent on Dr. Hesse *either* to show the prescriptive validity of those principles from which her assumptions derive (a process she herself has so excellently shown the difficulties of), or to allow less traditional and less determinedly "forward-looking" historians unhindered license peacefully to pursue their own hermetic hares.

EDWARD ROSEN

Was Copernicus a Hermetist?

1. Internal-External History of Science

If a history of science is to deserve the name, it must be "internal." A fully qualified historian of science knows the discipline whose history he undertakes to write. He masters his subject not only in the chronological period which chiefly interests him but also in the earlier and later stages. Like an alert pedestrian trying to cross a busy two-way thoroughfare, he looks not only straight ahead but also to the right and to the left.

A historian of science, however, is more than a harried pedestrian. He understands not only his chosen subject but also its social setting, insofar as that background affected the science. To that extent he is a historian, and to that extent his history of science will be "external." By the nature of his craft the historian of science is perforce a hybrid creature. He is in part historian, in part scientist. His product is both internal and external, both scientific and historical.

If a history of science endeavored to be exclusively internal, it would inevitably miss the social forces which affect the development of science. On the other hand, any history of science which attempted to be exclusively external would ignore the inner self-correcting dynamic of science. A satisfactory history of science combines comprehension of the scientific subject matter with understanding of the historical period. Its narrative records positive achievements and illuminating failures. It pursues the ramifications of ideas, sound and unsound. It scrutinizes the societal pressures impinging on the thought and activity of scientists, while at the same time discarding supposititious farfetched and spurious connections.

2. The Case of Archimedes

We have been told that "Syracuse does little to explain Archimedes."[1] His discovery that a segment of a parabola equals four-thirds of the triangle

[1] A. C. Crombie, ed., *Scientific Change* (New York: Basic Books, 1963), pp. 855, 876.

having the same base and altitude as the segment[2] was an achievement in pure geometry, not connected with or explained by his residence in Syracuse. But it was the king of Syracuse who "persuaded Archimedes to make for him offensive and defensive machines for every type of siege"[3] in which Syracuse was embroiled, and with Syracuse Archimedes, who owed to this external pressure both intellectual stimulation and violent death at the hands of an enemy soldier.

3. Copernicus and Hermetism

We have also been told that

the core of the [Renaissance Neoplatonist] movement was Hermetic, involving a view of the cosmos as a network of magical forces with which man can operate. The Renaissance magus had his roots in the Hermetic core of Renaissance Neo-Platonism, and it is the Renaissance magus, I believe, who exemplifies that changed attitude of man to the cosmos which was the necessary preliminary to the rise of science.

The Renaissance magus was the immediate ancestor of the seventeenth-century scientist. "Neo-Platonism" . . . was indeed the body of thought which . . . prepared the way for the emergence of science.

The emergence of modern science should perhaps be regarded as proceeding in two phases, the first being the Hermetic or magical phase of the Renaissance with its basis in an animist philosophy, the second being the development in the seventeenth century of the first or classical period of modern science.

. . . revived Platonism with the accompanying Pythagoro-Platonic interest in number, the expansion of theories of harmony under the combined pressures of Pythagoro-Platonism, Hermetism, and Cabalism, the intensification of interest in astrology with which genuine astronomical research was bound up, and . . . the expansion of alchemy in new forms, it is, I think, impossible to deny that these were the Renaissance forces which turned men's minds in the direction out of which the scientific revolution was to come.[4]

It may be illuminating to view the scientific revolution as in two phases, the first phase consisting of an animistic universe operated by magic, the second phase of a mathematical universe operated by mechanics.[5]

[2] Archimedes, *Quadrature of the Parabola*, Proposition 17.
[3] Plutarch, *Life of Marcellus*, section 14.
[4] Frances A. Yates, "The Hermetic Tradition in Renaissance Science," in Charles S. Singleton, ed., *Art, Science, and History in the Renaissance* (Baltimore: Johns Hopkins Press, 1967), pp. 255, 258, 271, 273.
[5] Frances A. Yates, *Giordano Bruno and the Hermetic Tradition* (Chicago: University of Chicago Press, 1964), p. 452.

In the first phase of the scientific revolution Nicholas Copernicus published his *Revolutions* in 1543. We are told that

it is . . . in the atmosphere of the religion of the world that the Copernican revolution is introduced.

That religion of the world which runs as an undercurrent in much of Greek thought, particularly in Platonism and Stoicism, becomes in Hermetism actually a religion.

Egypt, and its magical religion, becomes identified with the Hermetic religion of the world.

Nor does Copernicus fail to adduce the authority of *prisci theologi* (though he does not actually use this expression), amongst them Pythagoras and Philolaus to support the hypothesis of earth-movement.[6]

Copernicus never adduced the authority of Pythagoras,[7] and he cited Philolaus not as a theologian but as an earth-moving astronomer (*Revolutions*, I, 5):

That the earth rotates, that it also travels with several motions, and that it is one of the heavenly bodies are said to have been the opinions of Philolaus the Pythagorean. He was no ordinary mathematician, inasmuch as Plato did not delay going to Italy for the sake of visiting him, as Plato's biographers report.[8]

Although Copernicus does not use the expression *prisci theologi*, he does discuss the *prisci philosophi*, the ancient philosophers who contended that the earth occupied the center of the universe.[9] He also mentions the *prisci mathematici*, the ancient mathematicians or astronomers who maintained that the earth was motionless.[10] Whatever theology may have been professed by these ancient philosophers, mathematicians, and astronomers did not concern Copernicus, who does not adduce their authority as much as he analyzes their shortcomings.

We are further told about Copernicus that "at the crucial moment, just after the diagram showing the new sun-centred system . . . comes a reference to Hermes Trismegistus on the sun":

At rest, however, in the middle of everything is the sun. For in this most beautiful temple, who would place this lamp in another or better position than that from which it can light up the whole thing at the same time? For, the sun is not inappropriately called by some people the lantern of the

[6] *Ibid.*, pp. 153, 4–5, 6, 153–154.
[7] Edward Rosen, "Was Copernicus a Pythagorean?" *Isis*, 53 (1962), 504–508.
[8] Only Diogenes Laertius so reports (*Lives of the Philosophers*, Plato, chapter 6).
[9] Copernicus, *Revolutions*, I, 7.
[10] *Ibid.*, V, 2.

universe, its mind by others, and its ruler by still others. The Thrice Greatest [labels it a] visible god . . . (Copernicus, *Revolutions*, I, 10).[11]

Where the foregoing quotation is cut off, Copernicus continues: "and Sophocles' *Electra*, the all-seeing." But Sophocles calls the sun all-seeing in his *Oedipus at Colonus*, not in his *Electra*.[12] Evidently Copernicus did not verify his quotation from Sophocles.

We were told just above that Copernicus makes "a reference to Hermes Trismegistus on the sun." But Copernicus does not mention the name Hermes, and his version of the accompanying epithet is "Trimegistus," as the manuscript written with his own hand clearly shows.[13]

We are told that in the passage quoted above from Copernicus's *Revolutions* (I, 10) "the main echo is surely of the words of Hermes Trismegistus in the *Asclepius*."[14] Hermes' words read as follows:

The sun illuminates the other stars not so much by the power of its light, as by its divinity and holiness, and you should hold him, O Asclepius, to be the second god, governing all things and spreading his light on all the living beings of the world, both those which have a soul and those which have not.[15]

The foregoing words of Hermes Trismegistus in the *Asclepius* do not call the sun a visible god, as Copernicus said that "Trimegistus" did. Yet we hear that Copernicus "quoted, near his diagram of the new system, Hermes Trismegistus in the *Asclepius* on the sun as the visible god."[16]

On the other hand, the expression "visible god" does occur in an ancient theologian whom Copernicus chides as follows: "Lactantius, otherwise an illustrious writer but hardly a mathematician, speaks quite childishly about the earth's shape when he mocks those who declared that the earth has the form of a globe" (*Revolutions*, Dedication-Preface). These puerilities concerning the earth's form were uttered by Lactantius in his *Divine Institutes* (III, 24). In that same work (IV, 6) Lactantius quoted Hermes as saying (in Greek) that "the second god was created visible." This visible second god was misequated by Lactantius with Jesus, although Hermes

[11] Yates, *Giordano Bruno*, p. 154.
[12] Edward Rosen, "Copernicus' Quotation from Sophocles," in *Didascaliae, Studies in Honor of Anselm M. Albareda*, ed. Sesto Prete (New York: Rosenthal, 1961), pp. 369–379.
[13] *Nikolaus Kopernikus Gesamtausgabe*, I (Munich and Berlin: Oldenbourg, 1944), fol. 10r, line 6.
[14] Yates, *Giordano Bruno*, p. 154.
[15] *Ibid.*, pp. 152–153.
[16] *Ibid.*, p. 238; Frances A. Yates, *The Art of Memory* (London: Routledge, 1966), p. 153.

obviously means the perceptible universe.[17] When Copernicus says that "many of the philosophers have called it a visible god," perhaps he is echoing Lactantius's Hermes, among others, but here (*Revolutions*, I, Introduction) Copernicus's visible god (*visibilem deum*) is the universe, not the sun.

Copernicus uses the Latin words *visibilem deum* and not the Greek *theon horaton*, as quoted by Lactantius from the original Greek text of the *Asclepius*, which was available to Lactantius, but since his time has been lost. The *Asclepius* has survived in a Latin translation, which renders our passage as *qui videri . . . possit*.[18] Since this Latin translation, which used to be misattributed to Lucius Apuleius, has neither *visibilem* nor *deum*, it did not provide the model for Copernicus's visible god, whether this was the universe, according to many of the philosophers, or the sun, according to "Trimegistus."

The numerous Greek passages inserted by Lactantius in his *Divine Institutes* must have annoyed readers unfamiliar with that language. For when Lactantius later wrote the *Epitome* of his *Divine Institutes*, he eliminated the Greek quotations, including ours, which he replaced by his own Latin translation. This contains the expression *deum visibilem* in chapter 37 (42),[19] by contrast with *qui videri . . . possit* in Pseudo-Apuleius. However, in Copernicus's time Lactantius's *Epitome* was printed from a defective manuscript lacking chapter 37 (42). Hence Copernicus never actually laid eyes on *deum visibilem* in Lactantius's *Epitome*. Nor did that expression occur in Pseudo-Apuleius's translation of the *Asclepius*. Had Copernicus ever handled a copy of Hermes, with his knowledge of Greek he would not have fumbled the epithet "Trismegistus." As in the case of his miscitation of Sophocles, he may have relied on an imperfect recollection of something he had once heard said by somebody, presumably one of his professors with access to the complete manuscript of Lactantius's *Epitome* on which our modern editions are based,[20] or to one of the manu-

[17] Walter Scott, *Hermetica* (Oxford: Clarendon Press, 1924–36), I, 299; III, 19–20, 47–48; *Corpus hermeticum*, ed. A. D. Nock and A.-J. Festugière (Paris, 1945–54), II, 305, 365.
[18] Scott, *Hermetica*, I, 298, line 16; Nock and Festugière, eds., *Corpus hermeticum*, II, 305, line 2.
[19] *Corpus scriptorum ecclesiasticorum latinorum*, 19 (reprinted, New York: Johnson, 1965), p. 713, line 6.
[20] The discovery of the complete manuscript of Lactantius's *Epitome* was announced in *Giornale de' letterati d'Italia*, 6 (1721), 456, and *Bibliothèque ancienne et moderne*, ed. Jean LeClerc, 27 (1727), 339.

scripts of Lactantius's *Divine Institutes* containing a Latin translation of our Hermes passage.[21]

Nevertheless we are told that "Copernicus' discovery came out with the blessing of Hermes Trismegistus upon its head, with a quotation from that famous work in which Hermes describes the sun-worship of the Egyptians in their magical religion."[22] What Copernicus mistakenly believed to be a quotation is not found in the author miscalled "Trimegistus" by Copernicus, who obviously had only the slightest acquaintance with the hermetic literature, which he did not know at first hand. Yet we read that "even the impulse towards the breaking down of the old cosmology with heliocentricity may have as the emotional impulse towards the new vision of the sun the Hermetic impulse towards the world, interpreted first as magic by Ficino, emerging as science in Copernicus. . . ."[23]

Copernicus's emotional passage about the sun (*Revolutions*, I, 10) was quoted above. We are told that in it "there are perhaps echoes of Cicero's words for the sun in that famous Dream."[24] Cicero in *Scipio's Dream* (*Republic*, VI, 17) calls the sun "the universe's mind" (*mens mundi*), and Copernicus echoes *mundi . . . mentem*. When Copernicus undertook to "re-read the works of all the philosophers which I could obtain," he specifies (*Revolutions*, Dedication-Preface, I, 5) that he found a pivotal passage in Cicero. In calling the sun the universe's "ruler" (*rectorem*), Copernicus echoes *rector* in the *Natural History* (II, 12) of Pliny, from whom he took many expressions. In the cosmogonical story in the *Timaeus* (39 B) Plato's creator Craftsman kindled only one light, "which we now call the sun," in order that it might shine as far as possible throughout the entire heaven. Hence for an unswerving Platonist, as distinguished from a Neoplatonist, the sun was the universe's lantern (*lucernam mundi*),[25] the last of the five labels attached to the sun by Copernicus.

We are told that "Copernicus himself associated his discovery with Hermes Trismegistus."[26] That association, taking the form of a nonexistent quotation from a jumbled name, occurs in the company of Sophocles, Cicero, Pliny, and the Platonists.[27] In Copernicus's emotional passage

[21] *Corpus scriptorum ecclesiasticorum latinorum*, 19, pp. 288–289.
[22] Yates, *Giordano Bruno*, pp. 154–155.
[23] *Ibid.*, p. 156.
[24] *Ibid.*, p. 154.
[25] This description was transferred to the Virgin Mary by the tenth-century nun Hrotsvitha, *Opera* (Berlin, 1902), p. 32, line 79.
[26] Yates, *Giordano Bruno*, p. 168.
[27] Yet we have been told that Copernicus's "authorities are immediately Neoplatonic." Thomas S. Kuhn, *The Copernican Revolution* (Cambridge, Mass.: Harvard University Press, reprinted 1966), p. 130.

about the sun, the hermetic association is a shaky one-fifth of the five associations. The three words in which it is expressed (*Trimegistus visibilem deum*) occupy less than half a line in Copernicus's manuscript of the *Revolutions*. This handwritten volume contains more than 200 folios, averaging 10 words to the line and 40 lines to the page, so that the hermetic association amounts to about 0.00002 of the *Revolutions*. Copernicus's other works and his correspondence show no hermetic association at all. Yet we are told that "Bacon's admirers have often been puzzled by his rejection of Copernican heliocentricity and of William Gilbert's work on the magnet. . . . These notions might have seemed to Bacon heavily engaged in extreme forms of the magical and animist philosophy or like the proud and erroneous opinions of a magus."[28]

4. Bruno and Copernicus

We are also told that "Copernicus might well have bought up and destroyed all copies of the *Cena* had he been alive."[29] Had Copernicus been alive in 1584, when Giordano Bruno published his *Cena de le ceneri* (*Ash Wednesday Supper*), he would have read in the *Cena's* Third Dialogue that "Copernicus didn't believe that the earth moves, because this is an incongruity and impossibility. On the contrary, he attributed the motion to it, rather than to the sphere of the stars, for convenience in computing." The spokesman for Bruno replies: "It is certain that Copernicus understood the statement as he uttered it, and proved it with all his might." This uncompromising insistence that Copernicus maintained the earth's motion to be a physical fact provokes the question why the contrary opinion is expressed "if it cannot be inferred from some statement by him." The source of this misinterpretation of Copernicus is promptly identified as "a certain preliminary Address, stuck in by an ignorant and insolent jackass."[30] Had Copernicus been alive in 1584, he might well have bought up all copies of the *Cena* in order to distribute as widely as possible its forthright denunciation of the interpolated anonymous prefatory Address which utterly falsified his geokineticism. Bruno's *Cena* first publicly exposed this fraud,[31] which nevertheless continued to fool innumerable read-

[28] Yates, in Singleton, ed., *Art, Science, and History in the Renaissance*, p. 268.
[29] Yates, *Giordano Bruno*, p. 297.
[30] Bruno, *La cena de le ceneri*, ed. Giovanni Aquilecchia (Turin: Einaudi, 1955), p. 146, lines 4–21.
[31] This passage of the *Cena* was discussed by Frances A. Yates, "The Religious Policy

ers, including Delambre, the great nineteenth-century historian of astronomy.[32]

At Oxford University in 1583, according to a contemporary, Bruno undertook "to set on foote the opinion of Copernicus, that the earth did goe round, and the heavens did stand still; wheras in truth it was his owne head which rather did run round, & his braines did not stand stil."[33]

Fourteen years later, in 1597, upon receiving a Copernican book from Kepler, Galileo wrote to its author: "Many years ago I was converted to the theory of Copernicus. . . . I wrote out many reasons in favor of it, and rebuttals of opposing arguments. But I have not yet dared to publish them. . . . I would surely have the courage to make my thinking public if there were more people like you. But since there are not, I shall avoid such involvement."[34] Prudent Galileo was not burned at the stake like Bruno; he was merely sentenced to life imprisonment.

Although Bruno was not a professional astronomer, nobody before him understood and asserted that the sun is a star and the stars are suns.[35] This understanding was not attained by Copernicus, who was a professional astronomer amidst his other occupations. We recall having been told above that "even the impulse towards the breaking down of the old cosmology with heliocentricity may have as the emotional impulse towards the new vision of the sun the Hermetic impulse towards the world, interpreted first as magic by Ficino, emerging as science in Copernicus. . . ."[36] Further research is recommended to us: "Much more detailed 'ferreting out' of the motives behind the work of Renaissance scientists is needed before more positive statements can be made as to the influence upon them of the dominant Hermetic-Cabalist tradition."[37] No human ferret is needed to discover the motive behind the work of Copernicus, who said quite openly: "I was impelled to consider a different system of deducing the motions of the universe's spheres for no other reason than the realization

of Giordano Bruno," *Journal of the Warburg and Courtauld Institutes*, 3 (1939–40), 188, without understanding its significance for the history of science.

[32] Edward Rosen, "The Ramus-Rheticus Correspondence," *Journal of the History of Ideas*, 1 (1940), 366–367, citing I, 139–140, in Delambre's *Histoire de l'astronomie moderne*, which is being reissued by Johnson Reprint Corporation.

[33] Robert McNulty, "Bruno at Oxford," *Renaissance News*, 13 (1960), 303.

[34] *Le Opere di Galileo Galilei*, national edition, X, 68, lines 17–27; Edward Rosen, "Galileo and Kepler," *Isis*, 57 (1966), 263.

[35] Bruno, *Opera latine conscripta* (reprinted, Stuttgart-Bad Cannstatt: Frommann-Holzboog, 1961–62), vol. I, part 1, p. 212.

[36] Yates, *Giordano Bruno*, p. 156.

[37] *Ibid.*, p. 449.

that the mathematicians do not agree among themselves in their investigations of this subject" (*Revolutions*, Dedication-Preface). Copernicus's motive belongs to the internal, rather than the external, history of science. No hermetic-cabalist tradition was dominant in his mind. It was the opposition of Aristotelians and theologians that he feared.[38]

5. Modern Science and Hermetism

Mersenne's judgment of Campanella ("he will teach us nothing in the sciences"[39]) may be extended to virtually all the other persons in the hermetic-cabalist tradition. In the few borderline cases, standing with one foot in either camp, to what extent, if any, did their extrascientific beliefs affect their scientific work? Out of Renaissance magic and astrology came, not modern science, but modern magic and astrology.

[38] Edward Rosen, *Three Copernican Treatises*, 2nd ed. (New York: Dover, 1959), p. 23.

[39] Robert Lenoble, *Mersenne; ou La naissance du mécanisme* (Paris: J. Vrin, 1943), p. 41.