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The Hermetic Tradition in Renaissance Science¹

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If there is any characteristic by which the Renaissance can be recognized it is, I believe, in the changing conception of Man's relation to the Cosmos." That is a quotation from a fairly recent book on *Science and the Renaissance*, the writer of which proceeds to inquire where we should look for the origins of a change in the climate of opinion in western Europe which could have produced this changed relation to the cosmos. He looks, naturally, first of all in the movement known as 'Renaissance Neo-Platonism,' originating in the renewed study of Plato and the Platonists in the Florentine circle of Marsilio Ficino, but he dismisses this movement as useless for his search. There is no evidence, he thinks, that the Florentine academicians had any but an incidental interest in the problem of knowledge of the external world or of the structure of the cosmos. Yet the movement loosely known as "Renaissance Neo-Platonism" is the movement which—coming in time between the Middle Ages and the seventeenth century—ought to be the originator of the changed climate of opinion, the change in man's attitude to the cosmos, which was to be fraught with such momentous consequences. The difficulty has been, perhaps, that historians of philosophy may have somewhat misled us as to the nature of that movement. When treated as straight philosophy, Renaissance Neo-Platonism may dissolve into a rather vague eclecticism- But the new work done in recent years on Marsilio Ficino and his sources has demonstrated that the core of the 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

¹ Yates, Frances A. "The Hermetic Tradition in the Renaissance," in Art, Science, and History in the Renaissance, Charles Singleton, ed. Baltimore: The Johns Hopkins Press, 1968. Pp. 255-274.

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 word “Hermetic” has many connotations; it can be vaguely used as a generic term for all kinds of occult practices, or it can be used more particularly of alchemy, usually thought of as the Hermetic science *par excellence*. This loose use of the word has tended to obscure its historical meaning—and it is in the historical sense alone that I use it. I am not an occultist, nor an alchemist, nor any kind of a sorceress. I am only a humble historian whose favorite pursuit is reading. In the course of this reading and reading, I came to be immensely struck by the phenomenon—to which scholars in Italy, in the United States, and in my own environment in the Warburg Institute had been drawing attention, namely the diffusion of Hermetic texts in the Renaissance.³

I must very briefly remind you that the first work which Ficino translated into Latin at the behest of Cosimo de' Medici was not a work of Plato's but the *Corpus Hermeticum*, the collection of treatises going under the name of “Hermes Trismegistus.” And I must also remind you that Ficino and his contemporaries believed that “Hermes Trismegistus” was a real person, an Egyptian priest, almost contemporary with Moses, a Gentile prophet of Christianity, and the source—or one of the sources with other *prisci theologi*—of the stream of ancient wisdom which had eventually reached Plato and the Platonists. It was mainly, I believe, in the Hermetic texts that the Renaissance found its new, or new-old, conception of man's relation to the cosmos. I illustrate this very briefly from two of the Hermetic texts,

The “Pimander,” the first treatise of the *Corpus Hermeticum*, gives an account of creation which, although it seems to recall Genesis, with which Ficino of course compared it,⁵ differs radically from Genesis in its account of the creation of man. The second creative act of the Word in the “Pimander,” after the creation of light and the elements of nature, is the creation of the heavens, or more particularly of the Seven Governors or seven planets on which the lower elemental world was believed to depend. Then followed the creation of man who “when he saw the creation which the demiurge had fashioned . . . wished also to produce a work, and permission to do this

was given him by the Father. Having thus entered into the demiurgic sphere in which he had full power, the Governors fell in love with man, and each gave to him a part of their rule

Contrast this Hermetic Adam with the Mosaic Adam, formed out of the dust of the earth. It is true that God gave him dominion over the creatures, but when he sought to know the secrets of the divine power, to eat of the tree of knowledge, this was the sin of disobedience for which he was expelled from the Garden of Eden. The Hermetic man in the “Pimander” also falls and can also be regenerated. But the regenerated Hermetic man regains the dominion over nature which he had in his divine origin. When he is regenerated, brought back into communion with the ruler of “the all” through magico-religious communion with the cosmos, it is the regeneration of a being who regains his divinity. One might say that the “Pimander” describes the creation, fall, and redemption not of a man but of a magus—a being who has within him the powers of the Seven Governors and hence is in immediate and most powerful contact with elemental nature.

Here—in the Hermetic core of Ficinian Neo-Platonism—there was indeed a vast change in the conception of man’s relation to the cosmos. And in the Hermetic *Asclepius*, 6 the work which had been known all through the Middle Ages but which became most potently influential at the Renaissance through the respect accorded to the Egyptian Hermes Trismegistus and all his works, the magus man is shown in operation. The Egyptian priests who are the heroes of the *Asclepius* are presented as knowing how to capture the effluxes of the stars and through this magical knowledge to animate the statues of their gods. However strange his operations may seem to us, it is man the operator who is glorified in the *Asclepius*. As is now well known, it was upon the magical passages in the *Asclepius* that Ficino based the magical practices which he describes in his *De vita coelitus corn paranda*. And it was with a quotation from the *Asclepius* on man as a great miracle that Pico della Mirandola opened his “Oration on the Dignity of Man.” With that oration, man as magus has arrived, man with powers of operating on the cosmos through magia and through the numerical conjurations of cabala.⁸

I believe that the tradition which has seen in Pico della Mirandola’s oration and in

his nine hundred theses a great turning point in European history has not been wrong, though sometimes wrongly interpreted. It is not as the advocate of “humanism” in the sense of the revival of classical studies that he should be chiefly regarded but as the spokesman for the new attitude to man in his relation to the cosmos, man as the great miracle with powers of acting on the cosmos. From the new approach to them, Ficino and Pico emerge not primarily as “humanists,” nor even primarily, I would say, as philosophers, but as magi. Ficino’s operations were timid and cautious:

Pico came out more boldly with the ideal of man as magus. And if, as I believe, the Renaissance magus was the immediate ancestor of the seventeenth-century scientist, then it is true that “Neo-Platonism” as interpreted by Ficino and Pico was indeed the body of thought which, intervening between the Middle Ages and the seventeenth century, prepared the way for: the emergence of science.

While we may be beginning to see the outlines of a new approach to the history of science through Renaissance magic, it must be emphasized that there are enormous gaps in this history as yet—gaps waiting to be filled in by organized research. One of the most urgent needs is a modern edition of the works of Pico della Mirandola, an edition which should not be merely a reprint but which would trace the sources of, for example. the nine hundred theses. Though laborious, this would not be an impossible task, and until it is done, the historian of thought lacks the foundation from which to assess one of its most vital turning points.

It is convenient to consult the practical compendium for a would-be magus compiled by Henry Cornelius Agrippa as a guide to the classifications of Renaissance magic.⁹ Based on Ficino and the *Asclepius*, and also making use of one of Ficino’s manuscript sources. the *Picatrix*,¹⁰ and based on Pico and Reuchlin for Cabalist magic, Agrippa distributes the different types of magic under the three worlds of the Cabalists. The lowest or elemental world is the realm of natural magic, the manipulation of forces in the elemental world through the manipulation of the occult sympathies running through it. To the middle celestial world of the stars belongs what Agrippa calls mathematical magic . When a magician follows natural philosophy and mathematics and knows the middle sciences which come from them—arithmetic, music, geometry,

optics, astronomy, mechanics—he can do marvelous things. There follow chapters on Pythagorean numerology and on world harmony, and on the making of talismans. To the highest or supercelestial world belongs religious magic, and here Agrippa treats of magical rituals and of the conjuring of angels.

The magical world view here expounded includes an operative use of number and regards mechanics as a branch of mathematical magic. The Hermetic movement thus encouraged some of the genuine applied sciences, including mechanics, which Campanella was later to classify as “real artificial magic.”⁵¹ Many examples could be given of the prevalent confusion of thought between magic and mechanics. John Dee, for example, branded as the “great conjuror” for his angel-summoning magic, was equally suspect on account of the mechanical Scarabaeus which he constructed for a play at Trinity College, Cambridge. In his preface to Henry Billingsley’s translation of Euclid, Dee bitterly protests against the reputation for conjuring which his skill in mechanics has brought him:

And for . . . marueilous Actes and Feates, Naturally, Mathematically, and Mechanically wrought and contriued, ought any honest Student and Modest Christian Philosopher, be counted & called a Coniuror?

Yet there is no doubt that for Dee his mechanical operations, wrought by number in the lower world, belonged into the same world view as his attempted conjuring of angels by Cabalist numerology. The latter was for him the highest and most religious use of number, the operating with number in the supercelestial world.

Thus the strange mental framework outlined in Agrippa’s *De occulta philosophia* encouraged within its purview the growth of those mathematical and mechanical sciences which were to triumph in the seventeenth century. Of course it was through the recovery of ancient scientific texts, and particularly of Archimedes, that the advance was fostered, but even here the Hermetic outlook may have played a part which has not yet been examined. Egypt was believed to have been the home of mathematical and mechanical sciences. The cult of Egypt, and of its great soothsayer, Hermes

Trismegistus, may have helped to direct enthusiastic attention toward newly recovered scientific texts. I can only give one example of this.

In 1589 there was published in Venice a large volume by Fabio Paolini entitled *Hebdomades*. D. P. Walker has said of this work that it contains “not only the theory of Ficino’s magic but also the whole complex of theories of which it is a part: the Neo-Platonic cosmology and astrology on which magic is based, the *prisca theologia* and *magia*”¹⁴ and so on. It represents the importation of the Florentine movement into Venice and into the discussions of the Venetian academies. The movement has not yet been adequately studied in its Venetian phase, in which it underwent new developments. When speaking of the magical statues of the Hermetic *Asclepius*, Paolini makes this remark: “we may refer these to the mechanical art and to those machines which the Greeks call *automata*, of which Hero has written.”¹⁵ Paolini is here speaking in the same breath of the statues described by Hermes Trismegistus in the *Asclepius*, which the Egyptian magicians knew how to animate, and of the work on automata by Hero of Alexandria which expounds mechanical or pneumatic devices for making statues move and speak in theaters or temples. Nor is he intending to debunk the magic statues of the *Asclepius* by showing them up as mere mechanisms, for he goes on to speak with respect of how the Egyptians, as described by Trismegistus, knew how to compound their statues out of certain world materials and to draw into them the souls of demons. There is a basic confusion in his mind between mechanics as magic and magic as mechanics, which leads him to a fascinated interest in the technology of Hero of Alexandria. Such associations may also account for passages in the *Hebdomades*, to which Walker has drawn attention, in which Paolini states that the production of motion in hard recalcitrant materials is not done without the help of the *anima mundi*, to which he attributes, for example, the invention of clocks. Thus even the clock, which was to become the supreme symbol of the mechanistic universe established in the first phase of the scientific revolution. had been integrated into the animistic universe of the Renaissance, with its magical interpretations of mechanics.

Among the great figures of the Renaissance who have been hailed as initiators of modern science, one of the greatest is Leonardo da Vinci. We are all familiar with the

traditional reputation of Leonardo as a precursor, throwing off the authority both of the schools and of rhetorical humanism to which he opposed concrete experiment integrated with mathematics. In two essays on Leonardo, published in 1965, Professor Eugenio Garin argues, with his usual subtlety, that Vasari's presentation of the great artist as a magus, a "divine" man, may be nearer the truth. Garin points to Leonardo's citation of "Hermes the philosopher" and to his definition of force as a spiritual essence. According to Garin, Leonardo's conception of spiritual force "has little to do with rational mechanics but has a very close relationship to the Ficinian-Hermetic theme of universal life and animation." If as Garin seems to suggest, it is after all within the Renaissance Hermetic tradition that Leonardo should be placed, if he is a "divine" artist whose strong technical bent is not unmixed with magic and theurgy, whose mechanics and mathematics have behind them the animist conception of the universe, this would in no way diminish his stature as a man of genius. We have to get rid of the idea that the detection of Hermetic influences in a great Renaissance figure is derogatory to the figure. Leonardo's extraordinary achievements would be, on the hypothesis put forward by Garin, one more proof of the potency of the Hermetic impulses toward a new vision of the world, one more demonstration that the Hermetic core of Renaissance Neo-Platonism was the generator of a movement of which the great Renaissance magi represent the first stage.

In the case of John Dee, we do not have to get rid of a reputation for enlightened scientific advance, built up by nineteenth-century admirers, in order to detect the Hermetic philosopher behind the scientist. Dee's reputation has not been at all of a kind to attract the enlightened. The publication in 1659 of Dee's spiritual diaries, with their strange accounts of conferences with the spirits supposedly raised by Dee and Kelly in their conjuring operations, ensured that it was as a conjuror, necromancer, or deluded charlatan of the most horrific kind that Dee's reputation should go down to posterity. Throughout the nineteenth century this image of Dee prevailed, and it warned off those in search of precursors of scientific 'enlightenment from examining Dee's other works. Though Dee's reputation as a genuine scientist and mathematician has been gradually growing during the present century, some survival of the traditional prejudice against

him may still account for the extraordinary fact that Dee's preface to Billingsley's translation of Euclid (1570), in which he fervently urges the extension and encouragement of mathematical studies, has not yet been reprinted. While I suppose that practically every educated person either possesses one of the many modern editions of Francis Bacon's *Advancement of Learning* or has had easy access to them in some library, Dee's mathematical preface can still only be read in the rare early editions of the Euclid. (Fortunately this situation will not long continue, for a long-awaited edition of the Euclid and its preface is planned for publication in the near future.) Yet Dee's preface is in English, like Bacon's *Advancement*, and in a nervous and original kind of English; and as a manifesto for the advancement of science it is greatly superior to Bacon's work. For Dee most strongly emphasizes the central importance of mathematics, while the neglect or relative depreciation of mathematics is, as we all know, the fatal blind spot in Bacon's outlook and the chief reason why his inductive method did not lead to scientifically valuable results.

It is not for me here to go through the mathematics of the preface nor to discuss Dee's work as a genuine scientist and mathematician, consulted by technicians and navigators. The work done on these matters by E. G. R. Taylor and F. R. Johnson is well known, and there is a remarkable thesis on Dee by I. R. F. Calder which is unfortunately still unpublished. My object is solely to emphasize the context of Dee's mathematical studies within the Renaissance tradition which we are studying. That Dee goes back to the great Florentine movement for his inspiration is suggested by the fact that he appeals, in his plea for mathematics, to the "noble Earle of Mirandula" and quotes from Pico's nine hundred theses the statement in the eleventh mathematical conclusion that "by numbers, a way is to be had to the searching out and understanding of euey thyng, hable to be knowen." And it was certainly from Agrippa's compilation with its classification of magical practices under the three worlds that he drew the discussion of number in the three worlds with which the preface opens. It may be noticed, too, that it is with those mathematical sciences which Agrippa classifies as belonging to the middle celestial world that the preface chiefly deals, though there are many other influences in the preface, particularly an important influence of Vitruvius.

This may raise in our minds the curious thought that it was *because*, unlike Francis Bacon, he was an astrologer and a conjuror, attempting to put into practice the full Renaissance tradition of Magia and Cabala as expounded by Agrippa, that Dee, unlike Bacon, was imbued with the importance of mathematics.

I should like to try to persuade sensible people and sensible historians to use the word *Rosicrucian*. This word has bad associations owing to the uncritical assertions of occultists concerning the existence of a secret society or sect calling themselves Rosicrucians, the history and membership of which they claim to establish. Though it is important that the arguments for and against the existence of a Rosicrucian society should be carefully and critically sifted. I should like to be able to use the word here without raising the secret society question at all. The word *baroque* is used, rather vaguely, of a certain style of sensibility and expression in art without in the least implying that there were secret societies of baroquists, secretly propagating baroque attitudes. In a similar way the word *Rosicrucian* could, I suggest, be used of a certain style of thinking which is historically recognizable without raising the question of whether a Rosicrucian style of thinker belonged to a secret society.

It would be valuable if the word could be used in this way as it might come to designate a phase in the history of the Hermetic tradition in relation to science. A very generalized attempt to define two such phases might run somewhat on the following lines. The Renaissance magus is very closely in touch with artistic expression; the talisman borders in this period on painting and sculpture; the incantation is allied to poetry and music. The Rosicrucian type, though not out of touch with such attitudes, tends to develop more in the direction of science, mixed with magic. Thus though the Rosicrucian type comes straight out of the Renaissance Hermetic tradition, like the earlier magi, he may orientate it in slightly different directions or put the emphasis rather differently. The influx of Paracelsan alchemy and medicine, itself originally stimulated by Ficinian influences, is important for the latter or Rosicrucian type, who is often, perhaps always, strongly influenced by Paracelsus. The tradition in its later or Rosicrucian phase begins to become imbued with philanthropic aims, possibly as a result of Paracelsan influence. Finally, the situation of the Rosicrucian in society is

worse and more dangerous than that of the earlier magi. There were always dangers, which Ficino timidly tried to avoid and from which Pico della Mirandola did not escape. But as a result of the worsening political and religious situation in Europe, and of the strong reactions against magic in both Catholic and Protestant countries, the Rosicrucian seems a more hunted being than the earlier magi, some of whom seem able to expand quite happily in the atmosphere of the early Renaissance Neo-Platonism, feeling themselves in tune with the age. The artist Leonardo or the poet Ronsard might be examples of such relatively happy expansion of great figures who are not untinctured with the Hermetic core of Neo-Platonism. The Rosicrucian, on the other hand, tends to have persecution mania. Though usually of an intensely religious temper, he avoids identifying himself with any of the religious parties and hence is suspected as an atheist by them all, while his reputation as a magician inspires fear and hatred. Whether or not he belongs to a secret society, the Rosicrucian is a secretive type, and has to be. His experience of life has confirmed him in the Hermetic belief that the deepest truths cannot be revealed to the multitude.

John Dee seems obviously placeable historically as a Renaissance magus of the later Rosicrucian type. Paracelsist and alchemist, a practical scientist who wished to develop applied mathematics for the advantage of his countrymen, full of schemes for the advancement of learning, branded in the public eye as conjuror and atheist, Dee felt himself to be an innocent and a persecuted man. "O unthankfull Countrey men," he cries in the preface to the Euclid, "O Brainsicke, Rashe, Spitefull, and Disdainfull Countrey men. Why oppresse you me, thus violently, with your slaundering of me And he goes on to compare himself, significantly, with "Ioannes Picus, Earle of Mirandula," who also suffered from the "raging slander of the Malicious ignorant against him."

In the so-called Rosicrucian manifesto published in Germany in 1614 in the name of the Fraternity of the Rosy Cross, the characteristics of what I have called the Rosicrucian type of thinking are perceptible. The brethren are said to possess the books of Paracelsus, and the activity to which they are said to bind themselves is the philanthropic one of healing the sick, and that gratis. The manifesto states that the

founder of the society based his views and activities on “Magia and Cabala,” a mode of thinking which he found agreeable to the harmony of the whole world. It expresses a wish for closer collaboration between magician-scientists. The learned of Fez, says the writer, communicated to one another new discoveries in mathematics, physics, and magic, and he wishes that the magicians, cabalists, physicians, and philosophers of Germany were equally co-operative. Thus whether or not this manifesto really emanates from a secret society, it sets forth a Rosicrucian type of program, with its devotion to Magia and Cabala its mixed scientific and magical studies, its Paracelsan medicine.

The utopias of the Renaissance show many traces of Hermetic influences which can even be discerned, I believe, in Thomas More’s foundation work. Campanella’s *City of the Sun*, which he first wrote in prison in Naples in the early years of the seventeenth century, is a utopian city governed by priests skilled in astral magic who know how to keep the population in health and happiness through their understanding of how to draw down beneficent astral influences. This is after all a philanthropic use of magical science, though somewhat arbitrarily applied. And the Solarians were in general greatly interested in applied magic and science; they encouraged scientific inventions, all inventions to be used in the service of the community. They were also healthy and well skilled in medicine, that is in astral medicine of the Ficinian or Paracelsan type. I would classify the City of the Sun as belonging to the later or Rosicrucian phase of the Hermetic movement.

The Rosicrucian flavor is also clearly discernible in a less well-known work, the description of the ideal city of Christianopolis by Johann Valentin Andreae, published at Strasbourg in 1619.²⁷ Andreae’s Christianopolis is heavily influenced by Campanella’s City of the Sun. Its inhabitants, like Campanella’s Solarians, are practitioners of astral magic and at the same time are deeply interested in every kind of scientific research. Christianopolis is busy with the activity of scientists who are applying their knowledge in inventions which are to improve the happiness and well-being of the people.

When, after a course of reading of this type, one returns once again to the so much more famous *New Atlantis* of Francis Bacon (written in 1624), it is impossible not

to recognize in it something of the same atmosphere. The New Atlantis is ruled by mysterious sages who keep the citizens in tune with the cosmos; and in this late utopia the wisdom tradition is turning ever more and more in the direction of scientific research and collaboration for the betterment of man's estate. Yet there are significant differences as compared with the earlier Rosicrucian utopias which I have mentioned; the priests of the New Atlantis do not practice astral magic and are not exactly magi; its scientific institutions are drawing closer to some future Royal Society. But to me it seems obvious that the New Atlantis has its roots in the Hermetic-Cabalist tradition of the Renaissance, though this is becoming rationalized in a seventeenth-century direction. The magus had given place to the Rosicrucian. and the Rosicrucian is giving place to the scientist, but only very gradually.

Francis Bacon is, in my opinion, one of those figures who have been misunderstood and their place in history distorted by those historians of science and philosophy who have seen in them only precursors of the future without examining their roots in the past. The only modern book on Bacon which makes, or so it seems to me, the right historical approach is Paolo Rossi's *Francesco Bacone*, published in Italian in 1957 and now translated into English. The significant subtitle of Rossi's book is *Dalla Magia alla Scienza [From Magic to Science]*. Rossi begins by outlining the Renaissance Hermetic tradition, pointing out that Bacon's emphasis on the importance of technology cannot be disentangled from the Renaissance Hermetic tradition in which magic and technology are inextricably mingled. He emphasizes those aspects of Bacon's philosophy which show traces of Renaissance animism, and he argues that the two main planks of the Baconian position—the conception of science as power, as a force able to work on and modify nature. and the conception of man as the being to whom has been entrusted the capacity to develop this power—are both recognizably derivable from the Renaissance ideal of the magus. While urging that the approach to Bacon should take full cognizance of his roots in the Renaissance Hermetic tradition, Rossi emphasizes that such an approach does not diminish Bacon's great importance in the history of thought but should enable the historian to analyze and bring out his true position. In Rossi's opinion. Bacon's supreme importance lies in his insistence on the

co-operative nature of scientific effort, on the fact that advance does not depend on individual genius alone but in pooling the efforts of many workers, He emphasizes. and this second point is related to the first one, Bacon's polemic against the habit of secrecy which was so strongly ingrained in the older tradition. his insistence that the scientific worker must not veil his knowledge in inscrutable riddles but communicate it openly to his fellow workers. And finally he draws attention to Bacon's dislike of illuminism and of the pretensions of a magus to knowledge of divine secrets, his insistence that it is not through such proud claims but through humble examination and experiment that nature is to be approached.

I believe that Rossi has indicated the right road for further research on Bacon, who should be studied as a Rosicrucian type but of a reformed and new kind, reformed on the lines indicated by Rossi. through which the Rosicrucian type abandons his secrecy and becomes a scientist openly co-operating with others in the future Royal Society, and abandons also his pretensions to illuminism, to being the "divine" man admired in the Hermetic tradition, with its glorification of the magus, for the attitude of a humble observer and experimentalist. The interesting point emerges here that the humble return to nature in observation and experiment advocated by Bacon takes on a moral character, as an attitude deliberately opposed to the sinful pride of a Renaissance magus with his claims to divine insights and powers.

Yet Bacon's reactions against the magus type of philosopher or scientist themselves belong into a curious context. Rossi has emphasized that Bacon regarded his projected *Instauratio Magna* of the sciences as a return for man of that dominion over nature which Adam had before the Fall but which he lost through sin. Through the sin of pride, Aristotle and Greek philosophers generally lost immediate contact with natural truth, and in a significant passage Bacon emphasizes that this sin of pride has been repeated in recent times in the extravagances of Renaissance animist philosophers. The proud fantasies of the Renaissance magi represent for Bacon something like a second Fall through which man's contact with nature has become even more distorted than before. Only by the humble methods of observation and experiment in the Great Instauration will this newly repeated sin of pride be redeemed,

and the reward will be a new redemption of man in his relation to nature. Thus Bacon's very reaction against the magi in favor of what seems a more modern conception of the scientist contained within it curious undercurrents of cosmic mysticism. Though Bacon's attitude would seem to dethrone the Hermetic Adam, the divine man, his conception of the regenerated Mosaic Adam, who is to be in a new and more immediate and more powerful contact with nature after the Great Instauration of the sciences, seems to bring us back into an atmosphere which is after all not so different from that in which the magus lived and moved and had his being. In fact, Cornelius Agrippa repeatedly asserts that it is the power over nature which Adam lost by original sin that the purified soul of the illuminated magus will regain. Bacon rejected Agrippa with contempt. yet the Baconian aim of power over nature and the Baconian Adam mysticism were both present in the aspirations of the great magician. Though for Bacon, the claim of the magus to Illuminism would itself constitute a second Fall through pride.

Bacon's reaction against the animist philosophers as proud magi who have brought about a second Fall is extremely important for the understanding of his position as a reformed and humble scientific observer, and I would even go further than Rossi and suggest that some of Bacon's mistakes may have been influenced by his desire to rationalize and make respectable a tradition which was heavily suspected by its opponents, by the Aristotelians of the schools and by the humanists of the rhetoric tradition. Bacon's admirers have often been puzzled by his rejection of Copernican heliocentricity and of William Gilbert's work on the magnet. I would like to suggest, though there is hardly time to work this out in detail, that 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.

In the sensational works published by Giordano Bruno during his visit to England, of which Bacon must have been well aware, Bruno had made use of heliocentricity in connection with the extreme form of religious and magical Hermetism which he preached in England. Bruno's Copernicanism was bound up with his magical view of nature; he associated heliocentricity with the Ficinian solar magic and based his

arguments in favor of earth movement on a Hermetic text which states that the earth moves because it is alive. He had thus associated Copernicanism with the animist philosophy of an extreme type of magus. When Bacon is deploring the sinful pride of those philosophers who have brought about the second Fall, who, believing themselves divinely inspired, invent new philosophical sects which they create out of their individual fantasy, imprinting their own image on the cosmos instead of humbly approaching nature in observation and experiment, he mentions Bruno by name as an example of such misguided Illuminati, together with Patrizi, William Gilbert, and Campanella. Is it possible that Bacon avoided heliocentricity because he associated it with the fantasies of an extreme Hermetic magus, like Bruno? And is it further possible that William Gilbert's studies on the magnet, and the magnetic philosophy of nature which he associated with it, also seemed to Bacon to emanate from the animistic philosophy of a magus, of the type which he deplored?

The magnet is always mentioned in textbooks of magic as an instance of the occult sympathies in action. Giovanni Baptista Porta, for example. in his chapters on the occult sympathies and how to use them in natural magic constantly mentions the loadstone. The animist philosophers were equally fond of this illustration; Giordano Bruno when defending his animistic version of heliocentricity in the *Cena de le ceneri* brings in the magnet. I think that it has not been sufficiently emphasized how close to Bruno's language in the *Cena de le ceneri* is Gilbert's defense of heliocentricity in the *De magnete*. Gilbert, like Bruno, actually brings in Hermes and other *prisci theologi* who have stated that there is a universal life in nature when he is defending earth movement. There are passages in the *De magnete* which sound almost like direct quotations from Bruno's *Cena de le ceneri*. The magnetic philosophy which Gilbert extends to the whole universe is, it seems to me, most closely allied to Bruno's philosophy, and it is therefore not surprising that Bacon should list Gilbert with Bruno as one of the proud and fantastic animist philosophers or that notions about heliocentricity or magnetism might seem to him dangerous fantasies of the Illuminati, to be avoided by a humble experimentalist who distrusts such proud hypotheses.

Finally, there is the suggestion at which I hinted earlier. Is it possible that the

reputation of John Dee, the conjuror, conjuring angels with number in the supercelestial world with a magus-like lack of humility of the kind which Bacon deplored, might have made the Lord Verulam suspicious also of too much operating with number in the lower worlds? Was mathematics, for Bacon, too much associated with magic and with the middle world of the stars, and was this one of the reasons why he did not emphasize it in his method? I am asking questions here, obviously somewhat at random, but they are questions which have never been asked before, and one object in raising them is to try to startle historians of science into new attitudes to that key figure, Francis Bacon. To see him as emerging from the Renaissance Hermetic tradition and as anxious to dissociate himself from what he thought were extreme and dangerous forms of that tradition may eventually lead to new adjustments in the treatment both of his own thought and of his attitude toward contemporaries. It would be valuable if careful comparisons could be organized between the works of Dee, Bacon, and Fludd. The extreme Rosicrucian types, Dee and Fludd, might come out of such an examination with better marks as scientists than Bacon. Dee certainly would. and even Fludd might do better than expected.

Nevertheless, all this does not do away with Bacon's great importance.

As compared with Dee and Fludd, Bacon has unquestionably moved into another era in his conception of the role of the scientist and of the character of the scientist. Though Bacon descends from the magus in his conception of science as power and of man as the wielder of that power, he also banishes the old conception of the magus in favor of an outlook which can be recognized as modern, if the Adamic mysticism behind the Great Instauration is not emphasized. Bacon obviously qualifies as a member of the future Royal Society, though one with surviving affiliations with the occult tradition—as was the case with many early members of the Society. The figure of Bacon is a striking example of those subtle transformations through which the Renaissance tradition takes on, almost imperceptibly, a seventeenth-century temper and moves on into a new era.

I would thus urge that the history of science in this period, instead of being read solely forwards for its premonitions of what was to come, should also be read backwards, seeking its connections with what had gone before. A history of science

may emerge from such efforts which will be exaggerated and partly wrong. But then the history of science from the solely forward-looking point of view has also been exaggerated and partly wrong, misinterpreting the old thinkers by picking out from the context of their thought as a whole only what seems to point in the direction of modern developments. Only in the perhaps fairly distant future will a proper balance be established in which the two types of inquiry, both of which are essential, will each contribute their quota to a new assessment. In the meantime, let us continue our investigations in which the detection of Hermetic influences in some great figure and acknowledged precursor should be a parallel process to the detection of genuine scientific importance in figures who have hitherto been disregarded as occultists and outsiders.

And we must constantly beware of giving an impression of debunking great figures when we expose in them unsuspected affiliations to the Hermetic tradition. Such discoveries do not make the great figures less great: but they demonstrate the importance of the Renaissance Hermetic tradition as the immediate antecedent of the emergence of science. The example of this which I made the subject of a book is Giordano Bruno . Long hailed as the philosopher of the Renaissance who burst the bonds of medievalism and broke out of the old world view into Copernican heliocentricity and a vision of an infinitely expanded universe, Bruno has turned out to be an “Egyptian” magus of a most extreme type, nourished on the Hermetic texts. Bruno’s vision of an infinite universe ruled by the laws of magical animism with which the magus can operate is not a medieval or a reactionary vision. It is still the precursor of the seventeenth-century vision, though formulated within a Renaissance frame of reference. As I have tried to suggest in this paper, even the mathematical and mechanical progress which made possible the seventeenth-century advance may have been encouraged by Hermetic influences in the earlier movement. 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. The two movements should, I suggest, be studied

as inter-related; gradually the second phase sheds the first phase, a process which comes out through the double approach of detecting intimations of the second phase in the first and survivals of the first phase in the second. Even in Isaac Newton. as is now well known, there are such survivals, and if Professor Garin is right, even in Galileo, while Kepler provides the obvious example of a great modern figure who still has one foot in the old world of universal harmony which sheltered the magus.

Renaissance and early seventeenth-century literature abounds in vast tomes which it is beyond the power of any one scholar to tackle unaided. They sleep undisturbed on library shelves or are only dipped into at random, while people turn to the easier and more lucrative occupation of writing little books about the Renaissance and seventeenth century and the great names—Kepler, Newton. Galileo—run easily off all our pens. Yet do we really understand what happened? Has anyone really explained where Kepler, Newton, Galileo, came from? I wish that a concerted effort could be made, less on the published writings of the great in their modern and accessible editions than on the vast sleeping tomes. I think of two in particular with which I have often tried to struggle: Francesco Giorgi's *De harm onia mundi* and Marin Mersenne's *Harm onie universelle*. Giorgi's *Harmony of the World* is full of Hermetic and Cabalist influences; the Franciscan friar who wrote it was a direct disciple of Pico della Mirandola, This tome represents the Renaissance Hermetic-Cabalist tradition working on the ancient theme of world harmony. Mersenne is a seventeenth-century monk, friend of Descartes. And just as Bacon does in his sphere. Mersenne attacks and discards the old Renaissance world; his *Universal Harmony* will have nothing to do with the *anima mundi* and nothing to do with Francesco Giorgi, of whom he sternly disapproves. Mathematics replaces numerology in Mersenne's harmonic world; magic is banished; the seventeenth century has arrived. The emergence of Mersenne out of a banished Giorgi seems somehow a parallel phenomenon to the emergence of Bacon out of the magus. It is perhaps somehow in these transitions from Renaissance to seventeenth century that the secret might be surprised, the secret of how science happened. But to understand Mersenne and Mersenne's rejection of Giorgi, one must know where Giorgi came from. He came out of the Pythagoro-Platonic tradition plus

Hermes Trismegistus and the Cabala.

In a review of my book on Bruno,³⁸ Allen G. Debus has suggested that I have overemphasized the importance of the dating of the Hermetic writings by Isaac Casaubon in 1614 as weakening the influence of the Hermetic writings after that date. He points out that “the first half of the seventeenth century saw an increased interest in the occult approach to nature which parallels the contemporary rise of mechanical philosophy. The real collapse of the Renaissance magical science only occurs in the period after 1660. Until then it remained a positive force stimulating some scientists to a new observational approach to nature.”³⁸ I would accept this criticism as valid:

I think that I may have overestimated the importance of Casaubon’s dating, which was totally ignored by, for example, Fludd and Kircher, and I also believe, as indeed I have suggested in this paper, that the late Renaissance movement which I would like to label “Rosicrucian” does continue to exert a strong influence through the seventeenth century. Nevertheless I still think that Casaubon’s dating does, as it were, mark a historical term which helps to define and delimit the Hermetic movement, Though the importance of Ficino’s propagation of the Hermetic writings and his adoption of Hermetic philosophy and practice must not be exaggerated to the exclusion of the many other influences fostering the movement, yet it was basic, and the Hermetic attitude toward the cosmos and toward man’s relation to the cosmos which Ficino and Pico adopted was, I believe, the chief stimulus of that new turning toward the world and operating on the world which, appearing first as Renaissance magic, was to turn into seventeenth-century science. And it was the sanction which the misdating of the *Hermetica* gave to these writings that sanctioned procedures and attitudes which St. Augustine had severely condemned and which were prohibited by the Church. If, as Ficino believed, the *Hermetica* were all written many centuries before Christ by a holy Egyptian who foresaw the coming of Christ, this encouraged him and other Christian souls to embark on the Hermetic magic. Casaubon’s dating of the *Hermetica* as written after Christ destroyed an illusion without which the movement might not have gained its original momentum, though it could not stop the movement after it had gained such force and influence. That is perhaps a better way of putting it .

It would be absurd of course to suggest that the Hermetic texts and Ficino's interpretation of them were the only causes of the movement. These were only factors, though important ones, in disseminating a new climate of opinion through Europe which was favorable to the acceptance of magico-religious and magico-scientific modes of thinking. Neo-Platonism itself was favorable to this climate, and medieval traditions of the same type revived. If one includes in the tradition the 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 if one adds to all this complex stream of influences 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. This was the tradition which broke down Aristotle in the name of a unified universe through which ran one law, the law of magical animism. This was the tradition which had to contend with the so much more prominent and successful disciplines of rhetorical and literary humanism. This was the tradition which prepared the way for the seventeenth-century triumph. But it must be emphasized that the detailed work, the great body of research, necessary for tracing this movement is not yet done. It lies in the future.

There is yet another way of regarding this strange history of the Renaissance Hermetic tradition in its relation to science. We may ask whether the seventeenth century discarded notions from the earlier tradition which may have been actually nearer to the views of the universe unfolded by the science of today than the movement which superseded it. Was the magically animated universe of Bruno, so close to the magnetic universe of Gilbert, a better guess about the nature of reality than those seemingly so much more rational universes of the mechanistic philosophers?

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. An enquiry into both phases and their

interactions, may be a more fruitful line of approach to the problems raised by the science of to-day than the line which concentrates solely on the seventeenth-century triumph.

Professor Debus quotes these words of mine in his review, adding, "I heartily agree with this opinion, and in essence it is the approach which I have been taking in my own courses on Renaissance science." It is most gratifying to me to learn that a point of view which I put forward in some fear and trembling is actually already the basis of teaching in the United States. I must, however, not come before you on false pretenses, and I must emphasize that, just as I was careful to state in the beginning that I am no magician, so I must be even more careful to state at the end that I am no scientist. Though when I read in the *Observer* for September 26, 1965, that five hundred of the world's most expensive scientists, gathered at Oxford, were in a mood of breathless expectation because they believed that high-energy physics, burrowing ever deeper into matter, may be about to break into quite a new level of reality," it seemed to me that I had heard something like this before. In the Rosicrucian manifesto of 1614 it is announced that some great aurora is at hand in the light of which man is about "to understand his own nobleness and worth, and why he is called Microcosmus. and how far his knowledge extendeth into nature." Perhaps these words are not so much a prophecy of the limited vision of the seventeenth-century revolution as of yet another aurora. And perhaps the view of nature of a Rosicrucian like John Dee as a network of magical forces which can be dealt with by mathematics is nearer to the new aurora—notwithstanding his belief in talismans and in the conjuring of angels—than an ignorant person like myself can understand.