

Zeitschrift: Archives des sciences et compte rendu des séances de la Société
Herausgeber: Société de Physique et d'Histoire Naturelle de Genève
Band: 55 (2002)
Heft: 3

Artikel: Hidden knowledge : public knowledge
Autor: Rossi, Paolo
DOI: <https://doi.org/10.5169/seals-740301>

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

Download PDF: 02.05.2026

ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>

Archs Sci. Genève	Vol. 55	Fasc. 3	pp. 167-182	Décembre 2002
-------------------	---------	---------	-------------	---------------

HIDDEN KNOWLEDGE, PUBLIC KNOWLEDGE

BY

Paolo ROSSI*

1. *Prisca sapientia*

The classical myths and the ancient fables – wrote Francis Bacon – “must be regarded as neither being the invention nor belonging to the age of the poets themselves, but as sacred relics and light airs breathing out of better times, that were caught from the traditions of more ancient nations and so received into the flutes and trumpets of the Greeks” (Bacon, 1887-92, V, pp. 627, 697). That a very ancient knowledge can be revived or resuscitated, that it is in some way hidden in the farthest reaches of time, and that basic truths existed long before Greek philosophy but were subsequently lost or concealed, are "Hermetic" ideas that ran through much of seventeenth century culture and rises again in the work of many of the so-called modern authors. Not only in Bacon's and Newton's work (as we shall see) but also for example in Descartes, who was a resolute believer in the superiority of the Moderns over the Ancients. In *Rules for the Direction of the Mind* he writes: "I am convinced that certain primary seeds of truth [. . .] thrived vigorously in that unsophisticated and innocent age of antiquity [. . .]. Some writers were able to grasp true ideas in philosophy and mathematics [. . .]. But I have come to think that these writers themselves, with a kind of pernicious cunning, later suppressed this mathematics as, notoriously, many inventors are known to have done where their own discoveries were concerned, fearing that their method, just because it was so easy and simple, would be deprecated if it were divulged (Descartes, 1897-1913: X, p. 376).

In *De mundi systemate* (written between 1684 and 1686), Newton linked Copernican theory to not only Philolaus and Aristarchus but also Plato, Anaximander, and Numa Pompilius. To symbolise the round orb with the sun at its centre, Numa Pompilius erected a round temple to honour Vesta and decreed that a perpetual flame be kept in the middle of it. It is very likely, however, that this idea began with the Egyptians, the earliest astronomers. They in turn spread the soundest notions of philosophy abroad, in particular to the Greeks who tended more toward the study of philology than philosophy; "and we can even recognise in the worship of Vesta the spirit of the Egyptians who used concealed mysteries that were above the capacity of the common herd under

* Via Lucca Landucci 10, 50136 Firenze, Italy.

the veil of religious rites and hieroglyphic symbols" (Newton, 1983, pp. 28-9; Westfall, 1980, pp. 434-5). The notion of a *prisca sapientia* is also found in the *Classical Scholia*, which Newton had intended to add to the *Principia*. His aim was to prove that Greek and Italian philosophers, in addition to Egyptian astronomers, had known the phenomena and the laws of gravitational astronomy (ibid.). Newton, in fact, believed that it had always been known - if only symbolically - that the force of attraction diminished with respect to the square of distance: "The ancients did not adequately explain with what proportion gravity decreases as distance increases. Yet it seems they represented that proportion by celestial harmonies, using Apollo and his seven-stringed lyre to symbolise the sun and other six planets [. . .] and the intervals between the notes to represent the distance between the planets [. . .]. In the oracle of Apollo at Eusebius [. . .] the sun is called the King of seven-toned harmony. This symbol was used to show that the sun exerts its force on the planets [. . .] in inverse proportionate to the square of its distance from them" (ibid.: pp. 143-4).

Without a doubt, Newton was firmly convinced that he was rediscovering truths in natural philosophy that had been known since the dawn of time, revealed by God himself, concealed after the fall from grace, and then partially recovered in antiquity. I think that it is impossible to portray Newton as an "Hermetic" philosopher, or as "the last of the magicians" (according the provocative title of John Maynard Keynes). But I think also that to interpret all of Newton's statements as "modern" would be a hopeless task. A number of factors prevent us from coming to the hopelessly obsolete conclusion that Newton was a positivist scientist.

2. The "Moderns" and the Hermetic tradition

After the enormous bulk of research on the Hermetic Tradition and Renaissance Magic it is no longer possible to preserve a 'positivistic' attitude, or to claim to be scarcely interested in aspects of culture that, at least during the first half of the seventeenth century, were not considered the residue of dark mediaeval superstitions, but the ancient and respectable heritage of ideas to which not only Bruno, Campanella, and Robert Fludd helped themselves generously, but also such thinkers as Bacon, Gilbert, Kepler and Newton.

The *Corpus Hermeticum* (14 treatises from the second century AD translated by Marsilio Ficino between 1463 and 1464) placed the great legacy of ancient and medieval magical and astrological knowledge into abroad, organic Platonic-Hermetic scheme. A search for the Unity that underlies differences characterises the text; the desire to reconcile differences; the need for complete pacification in the One-All. To the men of that day, there was a fine and fleeting line between natural philosophy and mystic knowledge; between a man who knows and experiments with nature and a man like Faust, who sells his soul to the devil for knowledge of the natural world and power over it. Nature, in the magical tradition, was not just a continuous and homogeneous matter that filled space; it was animated by a soul, a source of internal and spontaneous activity. That soul-substance was (as for the Ionic thinkers of the fifth century BC) "full of demons

and gods". Every object overflowed with occult sympathies that connected it to the All. Matter was impregnated with the divine. The stars were living divine creatures. The world was the image or reflection of God and man was the image or the reflection of the world. Things in the greater world or macrocosm corresponded precisely to things in the miniature world or microcosm (of which man himself was a prime example and reference). The plants and forests were the hair and fur of the world, the rocks its bones, and subterranean waters its veins and blood. And man, at the centre of the world, represented its heart. Insofar as he was the reflection of the universe, man was capable of revealing and grasping those secret relationships. Magicians and sorcerers were figures able to penetrate the infinitely complex reality of a system of similarities and Chinese nesting boxes that led to the All and enclosed it. The sorcerer was privy to the chain of connections that flowed from the top down, and - through invocation, numbers, images, names, sounds, chords, and talismans - knew how to construct an unbroken chain of ascending links.

It is well known that in defending the central position of the Sun, Copernicus calls upon Hermes Trismegistus and reveals the influence of the magico-hermetic world-picture as Marsilio Ficino had elaborated it. Francis Bacon condemns magic and alchemy on ethical grounds. He accused it of imposture and of megalomania. He refuted their foggy method and their intentional unintelligibility, their attempt to replace human sweat by a few drop of elixir. But he borrows from the great books of Renaissance magic (very likely from the texts by Cornelius Agrippa of Nettesheim) the idea that man can attempt to make himself master of nature. Bacon understands knowledge not as contemplation or recognition, but as a *venatio*, a hunt, an exploration of unknown lands, a discovery of the unknown. Bacon's definition of man as "the servant and interpreter of nature" (Bacon, 1887-1892, IV, p. 47) is the same definition we find in the texts by Giambattista Della Porta or Agrippa. Bacon also talks of the "perceptiveness", the "desires" and "aversions" of matter.

William Gilbert also refers to Hermes and Zoroaster when he links his doctrine of magnetism with universal animation. The first chapter of *De magnete* reviews the most important works on natural magic. Kepler displays a profound knowledge of the *Corpus hermeticum*, and his conviction that there is a secret correspondence between the structures of geometry and those of the universe, as well as his theory of a celestial music of the spheres, is imbued with Pythagorean mysticism. As Alexandre Koyré pointed out the three laws that bear Kepler's name emerged in an atmosphere - taking Galileo as a point of reference - that can hardly be considered "modern". Tycho Brahe persists in considering astrology as the legitimate and practical application of his science: "I am used," he writes in 1589, "to calling alchemy the terrestrial astronomy since the subjects under examination bear analogy to the celestial bodies and to their influence." Galileo himself, always so clear and rigorous, and in whose writings there are no concessions to mysticism or magic, mentions Dionysius the Areopagite in a letter and speaks of "an extremely spiritual substance that warms, gives new life to all living creatures and makes them fecund". Descartes, who in his maturity rejected all forms of symbolism and whose philosophy became a by-word for rational clarity, placed, in his youth, the works of the

imagination before those of reason. Like so many magicians in the sixteenth century, he enjoyed constructing automatons and "shadow gardens"; like so many followers of Raymond Lull he insisted on the unity and harmony of the cosmos: "There is one active force, love, charity, harmony in things. . . . Every corporeal form works by harmony". These themes reappear in a different key in Leibniz, whose logic blends theories taken from the Lullian tradition of hermeticism and cabalism and the dreams of Comenius' *pan-sophia*. His *scientia generalis* not only embraces logic, it is also an art of invention (*ars inveniendi*) and a method for ordering knowledge (*methodus disponendi*), it is synthesis and analysis, didactics and the science of teaching, the art of remembering or mnemonics, *ars characteristic* or symbolic art, philosophical grammar, Lullian art, the cabal of sages and natural magic. (Couturat, 1903, p. 511). In 1679, after his sojourns in Paris and London, and his great mathematical discoveries, Leibniz spoke again about his invention in tones which are reminiscent of the miraculous and magical claims of the Lullist treatises and manuals of art of memory of the sixteenth century: "My invention contains all the function of reason: it is a judge for controversies; an interpreter of notions; a scale for weighing probabilities; a compass which guides us through the ocean of experience; an inventory of thing; a table of thoughts; a microscope for scrutinising things close at hand; a telescope for discerning distant things; a general calculus; an innocent magic; a non chimerical cabal; a writing which everyone can read in his own language; and finally a language which can be learnt in a few weeks, travelling swiftly across the world, carrying the true religion with it, wherever it goes" (Leibniz 1923, I, ii, pp. 167-9).

3. Truth: fortified by silence and destroyed when declared

The books about magic written in the XVIth century today appear to be a strange combination of subjects. A single manual includes pages on optics, mechanics and chemistry, formulas for medicinal cures, technical instructions on how to build machines and mechanical games, secret codes, recipes for food as well as rat poison, advice to fishermen, hunters, housewives, and prestidigitators, information on hygiene, aphrodisiacs and sex, and references to metaphysics, mystical theology, traditional Egyptian wisdom, the Bible and classical and medieval philosophy. Moreover, magic - as associated with Giordano Bruno, Cornelius Agrippa, and Tommaso Campanella - was deeply tied to ideas of cultural reform, millenarianism, and hopes for radical political renewal. The language of alchemy and magic was ambiguous and allusive precisely because the idea that secret knowledge could ever be expressed clearly and simply was incomprehensible. Language was structurally and deliberately full of semantic twists and turns, metaphor, analogy, and allusion. For instance, the alchemist Bono of Ferrara wrote that "no ancient could ever achieve the divine subject of this art through his natural intellect, nor according to natural reason alone, nor according to experience because it -like a divine mystery - is above reason and experience" (Bono of Ferrara, 1602, p. 123). The alchemist did not write about gold and sulphur in a concrete state. An object was never simply itself; it was also the symbol of something else, receptacle of a transcendent reality. By virtue of their

understanding the secrets of Art, initiates "prove that they belong to the group of the enlightened. Lovers of Art, wrote Bono of Ferrara, "understand one another as if speaking a common language that is incomprehensible to others and known only to themselves" (Bono of Ferrara, 1602, p. 132). In *Magia adamica*, Thomas Vaughan stated that knowledge is made up of visions and revelations, and only through divine enlightenment can man reach a complete understanding of the universe (Vaughan, 1888: p. 103). The distinction between *homo animalis* and *homo spiritualis*, the separation of the simple from the wise, became the identification of the ends of knowledge with salvation and individual perfection. Science corresponded to the purification of the soul and became a means for escaping one's destiny on earth. Intuitive knowledge was superior to rational knowledge; an occult knowledge of things was equated with freedom from evil: "I have written this work for you, sons of knowledge. Read it carefully and reap the wisdom that has been scattered throughout. What may have been concealed in one part has been made manifest in another [. . .]. I have written this for you alone of pure spirit and chaste mind, whose uncorrupted faith fears and honours God [. . .]. You alone will find that which I have meant for you alone to find. The secrets cloaked in mystery cannot be revealed without occult intelligence, so all of magical science will course through you as will the virtues of Hermes, Zoroaster, Apollonius, and the other practitioners of wondrous things" (Agrippa, 1550,1, p. 498).

"Ad laudem et gloriam altissimi et omnipotentis Dei, cuius est revelare suis predestinatis secreta scientiarum (For the promise and glory of almighty God, who reveals to the elects the secrets of knowledge)". The theme of secrecy occurs in the opening pages of the *Picatrix* and continues throughout. Philosophers skilfully hid magic behind secret words, and this they did for altruistic motives: *si haec scientia hominibus esset discoperta, confunderent universum* (If this knowledge were revealed to all men, it would confound the universe). Science had two sides; one open and the other closed. The obscure science was profound, for the very words that described the natural order were those given to Adam by God, and comprehensible to only a select few (Perrone Compagni, 1975, pp. 298). What is striking about the idea of secrecy is not the formulas themselves, but their immutability. The same authors, citations, and examples recur in occult texts through different periods in history. Cornelius Agrippa, for example, tells us that Plato forbade the disclosure of the mysteries, Pythagoras and Porphyry bound their disciples to secrecy, Orpheus as well as Tertullian demanded vows of silence, and Theodotus was blinded because he tried to penetrate the mysteries of Hebrew scripture. Indians, Ethiopians, Persians, and Egyptians spoke through riddles. Plotinus, Origen, and Ammonius' other disciples vowed never to reveal their teacher's dogma.

In the opening paragraph of *De magia veterum*, printed in Basel in 1575 we can read: "Who would know secret things, let him know also how to guard secrets with secrecy, reveal what is fit to be revealed and set his seal on that which should be sealed up; let him not give to dogs what is sacred, not cast pearls before swine. Observe this law and the eyes of your mind are opened to the understanding of secret things, and you shall hear all your heart's desire revealed to you through divine power" (Prost, 1881, pp. 576 ss). We ask you – Paracelsus writes "that following the practice of the ancient Fathers you

be so good as to handle and preserve this divine mystery with the utmost secrecy" (Paracelsus, 1584, p. 27).

"Every magical experience abhors the public and wants to remain hidden; it is fortified by silence and destroyed when declared" (Agrippa, 1550: I, p. 498). Truth was transmitted personally by "the whispers of tradition and oral discourse." Direct communication between teacher and disciple was privileged: "Without a trusted and expert teacher, I do not know if it is possible to divine understanding simply by the reading of a text [. . .]. These things are not entrusted to letters or written with the pen, but infused from spirit to spirit through sacred words" (Agrippa, 1550, II, p. 904).

In the Gospel according to Matthew (7: 6), Jesus says: "Do not give dogs what is holy, and do not throw your pearls before swine, lest they trample them under foot and turn to attack you." For many centuries, scholars interpreted this passage to mean that what was precious was select, and that truths should be kept secret for their spread could be dangerous.

From the beginning of European intellectual history, the importance of communicating ideas has always clashed with the belief that the mysteries of knowledge should be available only to an elite few. More than 500 manuscripts of the *Secreta secretorum* (which was attributed to Aristotle and was described by Lynn Thorndike as "the most popular book of the Middle Ages") have been identified in European libraries.

The Hermetic view of the world and of history was strongly tied to the Gnostic and Avveroistic notion that there were two kinds of people: the simple, ignorant masses and an elect few capable of discerning truths concealed in words and symbols and so privy to the sacred mysteries. In the hermetic-magical tradition, the themes of a distinction between two types of man, and the themes of secrecy seem inextricably bound up with one another: "Is the intellect, Trismegistus, not of the same quality in all men? Not all men, Asclepius, reach real knowledge... The intimate union of sensation and intellect is proper to man. But not every man possesses intellect. There are in fact two types of men: the material and the essential man" (*Corpus Hermeticum* 1945-54: I, 98; II, 303).

4. Mechanics

The occult knowledge of magicians and alchemists was been fiercely contested by mechanics and engineers of the Renaissance even before the great modern philosophers opposed it. Vanoccio Biringuccio's *De la Pirotechnia libri dieci* was published in Venice in 1540 and was the first printed book dealing with metallurgy. His author boasted of his uniqueness in publishing a book that was not based on others books but was drawn from the direct experience of nature. Biringuccio explicitly theorised about the function the investigation of new facts can exercise on the enlargement of human knowledge. The work's intention was descriptive. Biringuccio rejected all manner of rhetorical embellishment in the name of a faithful and stylistically bare description. He viewed rhetorical flourishes only as a device employed by men who "wanting to show that they are master, adorn their words when speaking of things in order to colour their lies better with a

thousand fables” (Biringuccio, 1942, p. 425). Biringuccio placed the alchemists in this category, and the polemic he conducted against the claims of alchemy is based on what he points to as noncodifiable character of the processes employed by its practitioners. He accused alchemists of not being able to codify their methods and concentrating only on ends, offering "authoritative testimony rather than possible reasons of demonstrable effects. Some cite Hermes, Brother Arnoldo, or Raymond, others Geber, Ockham, Craterius, or the saintly Thomas Aquinas, and even a certain Franciscan brother Elias; these authors, invoking the dignity or even sacredness of their philosophical knowledge, expect a sort of respectful faith of their readers or that their listeners either remain silent like ignorants or else confirm whatever they say" (Biringuccio, 1942, p. 36). The alchemists being avid for immediate, practical results, neglected every patient investigations of the means: "The great desire that they have to become rich, causes them to gaze in the distance and hinders them from seeing the intermediate steps" (Biringuccio, 1942, p. 39).

Unlike Biringuccio, Georg Agricola (Georg Bauer) was a man of vast culture and broad interests. *De re metallica* published in 1556 remained for two centuries the unsurpassed work on mining technology. The Agricola's book was kept chained to the altars of Potosi churches so that the miners would come to perform their devotions every time they had a technical problem to solve. The questions posed by alchemists are in principle, from Agricola's point of view, impossible to decode "because the writers upon these things use strange names, which do not properly belong to the metals, and because some of them employ now one name, and now another, invented by themselves, though the thing itself changes not" (Agricola, 1563, pp. 4-5). What Agricola proposes to defend and to revive was the study of natural objects. In the *Preface* he made clear how his work originated from an attitude of clarity and scrupulous diligence: "I have devoted much labour and care, and have even gone to some expenses upon it; for with regard to the veins, tools, vessels, sluices, machines, and furnaces, I have not only described them, but have also hired illustrators to delineate their forms, lest descriptions which are conveyed by words should either not be understood by the men of our times, or should cause difficulty to posterity" (Agricola, 1950, p. xxx). The attitude assumed here by Agricola compared closely with that adopted by Andrea Vesalius in a different field of research.

Later on, a series of social and economic events reinforced the value of "secrecy" in the world of mechanics as well. Many Renaissance artisans and engineers insisted upon the right to keep their own inventions secret, but their motivations were purely financial and unrelated to any idea that the masses were unworthy. The first patents date back to the early fifteenth century; and their use increased dramatically in the sixteenth century (Eamon, 1990; Maldonado, 1991).

4. Francis Bacon: a new image of science

In the Hermetic tradition, as in the tradition of Platonism, the natural world is conceived as the image or living manifestation of God. Understanding nature can reveal the presence in the world of divine ideas and archetypes. The Bacon's rejection of any

natural philosophy founded on allegorical interpretations of Scriptures meant a withdrawal from exemplarism and symbolism, both common features of mediaeval philosophy and still flourishing in the seventeenth century. As all works - says Bacon - show the power and ability of their maker, but not his image, so God's work "do shew the omnipotency and wisdom of the maker, but not his image" (Bacon, 1887-1892. III, p. 350). The distinction between the will and power of God, so fully and subtly present in Baconian texts, is very important. "The heavens declare the glory of God, and the firmament showeth his handworks": this verse from the *Psalms* (18,2) is quoted by Bacon several times. The image of the world, immediately after the Word, is a sign of the divine wisdom and power, and yet the Scriptures do not call the world "the image of God", but regard it only "the work of his hands", neither do they speak of any other image of God, than man. Theology is concerned with knowing the book of the word of God; natural philosophy regards the book of God's works. The book of Scripture reveals the will of God, the book of nature, his power. The study of nature has nothing to say about God's essence or his will (Bacon, 1887-1892. IV, pp. 340-43).

Ritual magic, according to Bacon, goes against the divine commandment that men earn their bread by the sweat of their brow, and "proposes that by following a few simple and easy steps man can achieve .the noble ends that God demands he acquire only by his own labour." Inventions, he continues, "are cultivated by few and in absolute and almost religious silence. "

Bacon proposed to the European culture an alternative view of science. For him science had a public, democratic and collaborative character, individual efforts contributing to its general success. In science, as Bacon conceives it, truly effective results (not the illusory achievements of magicians and alchemists) can be attained only through collaboration among researchers, circulation of results, and clarity of language. Scientific understanding is not an individual undertaking. The extension of man's power over nature is never the work of a single investigator who keeps his results secret, but is the fruit of an organised community financed by the State or by public bodies. Every reform of learning is always a reform also of cultural institutions and universities.

Not only a new image of science, but also a new portrait of the "natural philosopher" took shape in Bacon's pages. A chaste patience, a natural modesty, grave and composed manners, a smiling pity are the characteristics of the man of science in Bacon's portrait of him. In the *Redargutio philosophiarum* Bacon wrote : "Then he told me that in Paris a friend had taken him along and introduced him to a gathering, 'the sight of which', he said, 'would rejoice your eyes. It was the happiest experience of my life'. There were some fifty men there, all of mature years, not a young man among them, all bearing the stamp of dignity and probity. (...) At his entry they were chatting easily among themselves but sitting in rows as if expecting somebody. Not long after there entered to them a man of peaceful and serene air, save that his face had become habituated to the expression of pity (...). He took his seat, not on a platform or pulpit, but on the level with the rest and delivered the following address..." (Bacon, 1887-1892, III, 559, trans. in Farrington, 1964, pp. 104-5).

Bacon's portrait doubtless resemble Galileo or Einstein more than it does the turbulent Paracelsus or the unquiet and skittish Cornelius Agrippa. The titanic bearing of the Renaissance magus is now supplanted by a classical composure similar to that of the "conversations" of the earliest Humanists. Also in Galileo's *Dialogo* and in Descartes' *Recherche de la vérité* we find the same familiar tone and style of a conversation in which (Descartes wrote) "several friends, frankly and without ceremony, disclose the best of their thoughts to each other" (Descartes, 1897-1913, X, p. 498) But there is beside, in Bacon, the quiet confidence that comes from knowing the new powers made available to man by technology and collaboration.

The new kind of learning, to which Bacon is looking, must get away from touches of genius, arbitrary conclusions, chance, hasty summaries. The emphasis laid by Bacon on the social factor in scientific research and in determining its ends, places its philosophy on a radically different plane from that of the followers of Hermetic tradition. Bacon's insistence on the organisational and institutional aspects of science stemmed from his own definition of learning, which is often hindered by "the nature of the society and the policies of the state": "That there is no composition of estate or society, nor order or quality of persons, which has not some points of contrariety towards true knowledge. That monarchies incline wits to profit and pleasure, and commonwealths to glory and vanity. That the universities incline wits to sophistry and affectations, cloisters to fables and unprofitable subtlety, study at large to variety and that it is hard to say, whether mixture of contemplations with an active life, or retiring wholly to contemplations, do disable and hinder the mind more" (Bacon, 1887-1892, III, p. 252).

5. Science as a public knowledge

For a thousand years (or the ten centuries of the Middle Ages) the dominant figures in western culture were the saint, the priest, the doctor, the university professor, the soldier, the craftsman, and the sorcerer. Later, the humanist and courtier took their places alongside these figures, and then between the mid-sixteenth and mid-seventeenth centuries new ones were added: the mechanic, the natural philosopher, and the virtuoso, or free experimenter. The values and the ends theorised for the composite groups of intellectuals and artisans who contributed in the early seventeenth century to the development of science were different from the goals of individual sanctity or literary immortality and from the aims of an exceptional and "demonic" personality. Scientific knowledge developed in a climate of bitter controversy not only with hermetic tradition, but also with monastic, scholastic, humanistic, and scholarly learning. John Hall, in a 1649 motion to Parliament, charged that universities did not teach chemistry, anatomy, languages or experiments, students – he said -were like mummies who had been taught science 3,000 years ago in hieroglyphics awakening from a long sleep.

During the tumult of the religious wars in Europe, the men who first called themselves "natural philosophers" constructed smaller and more tolerant societies within the greater societies in which they lived. "When I lived in London - wrote John Wallis in

1645 - I had the opportunity to meet some people who were working on what we today call new or experimental philosophy. We excluded theology from our discourse, and were more interested in physics, anatomy, geometry, statics, magnetism, chemistry, mechanics, and natural experiments". The members of the first Academies wanted to protect themselves primarily from two things: politics and the intrusiveness of theology and the Church. The Accademia dei Lincei "has in particular banned from their subjects of study any argument outside the natural and mathematical, and eliminated political issues". The Royal Society requests "a close, naked, natural way of speaking and clear senses [. . .]: and preferring the language of artisans, countrymen, and merchants before that of wits or scholars" (Sprat, 1667, p. 113).

With regard to scientific academies and societies, several points should be emphasised. First, the meetings of learned men were governed by a code of conduct, and it was a point of principle to exercise a critical attitude towards all statements. Truth was not bound to the authority of the person who declared it, but only to the proof of the experiment and force of the demonstration. Secondly, it should be remembered that all adepts of the new science favoured linguistic rigor and non-allusive terminology. This position went hand-in-hand with the refusal to make any basic distinction between scholars and laymen. Theories had to be fully communicable and experiments continually repeatable. According to William Gilbert, "sometimes we use new words. Though not to obscure like the alchemists do, but so that hidden things can be fully understood" (Gilbert, 1958: Praefatio).

The truths that are called common notions (*notiones communes*) Descartes wrote in his *Principia Philosophiae*, are the ones that many people are capable of perceiving clearly and distinctly. Nevertheless, to some people, these truths are not sufficiently self-evident. It was not because "one man's faculty of knowledge extends more widely than another's". Inability to perceive truth was caused by prejudices acquired in childhood that were extremely difficult to shake off. I hardly need recall the famous beginning of the *Discours sur la méthode*, which affirms that "good sense is the best distributed thing in the world". The power of judging well and the faculty of distinguishing truth from falsehood "is by nature equal in all men". Reason or good sense, which distinguishes us from animals, "is complete in each one of us". The diversity of our opinions did not arise "because some of us are more reasonable than others but "because we direct our thoughts along different paths and do not attend to the same things" (Descartes 1897-1913: IX pp. 46, 58, 60; Descartes 1952, p.116).

Every man, according to Hobbes, "brought philosophy, that is, Natural Reason, into the world with him". Errors and deviations depend only on the lack of the right method. The *recta ratio* is present in all men and makes them equal. Differences in understanding derive from the passions, that is to say, from the body and from customs. Reason, Hobbes affirms in another text, "is no less natural than passion, and is the same in all men". In the first lines of the *De corpore*, Hobbes had opposed his philosophy to that "which is found in the metaphysic codes" and to that "by which philosophers' stones are made". All knowledge which is acquired by divine inspiration or which come to us not by reason, but by divine grace, in an instant, and, as it were, by some supernatural sense, is

strictly excluded from philosophy (Hobbes 1839-77: I, XIII, 1-2; IV, 87). The method that leads to science and truth is made for all men: "If you would like," Hobbes says to the reader in the preface to *De corpore*, "you too can use it".

All who criticised and opposed magic emphasised the "priestly" nature of magical knowledge and the commingling of science and religion that characterised the Hermetic tradition. In his *Quaestiones in Genesim* (1623) father Mersenne asked himself why followers of alchemy were not willing to study the results of their discoveries "without mystery and secrets?". Francis Bacon's high opinion of the intellectual courage shown by Galileo in his astronomical discoveries included praise of his intellectual honesty: "men of this sort have continued to account for every single point of their research in a honest and perspicuous manner" (Bacon, 1887-92: III, p. 736). Those who get lost following unusual paths, wrote Descartes, are less readily excused than those who err in the company of others. In this "darkness of life," believed Leibniz, it was necessary to walk together because scientific method was more important than individual genius and the goal of philosophy was not to improve the intellect of the individual but that of all men. Leibniz, Hartlib and Comenius, each in his own way, referred to the ideal of the "advancement of learning" or the development and spread of knowledge. To the author of the *Pansophiae prodromus*, "the people's desire for schools" was characteristic of this new age. He believed that this desire produced "the great increase of books in every language and every nation so that even children and women could become familiar with them [. . .]. Now finally there emerges the steady drive of some people to perfect the method of learning to such a degree that anything worth learning can be easily instilled into minds. If this effort (as I hope) is successful, we shall find the sought-for path of rapidly teaching everything to everybody" (Comenius, 1974, p. 491).

It was inevitable that over the course of the seventeenth century the battle in favour of a universal knowledge that could be comprehended by everyone because it could be communicated and constructed by everyone shifted from the level of the ideas and projects of the intellectual to those of the institutions. Thomas Sprat had this to say about the membership of the Royal Society: "As for what belongs to the Members themselves, that are to constitute the Society: it is to be noted that they have freely admitted men of different religions, countries, and professions of life. [. . .] For they openly profess not to lay the foundation of an English, Scotch, Irish, Popish, or Protestant philosophy; but a philosophy of mankind." About the design of the organisation he wrote: "They have tried to put it into a condition of perpetual increasing; by fettling an inviolable correspondence between the hand and the brain. They have studied to make it not only an Enterprise of one season, or of some lucky opportunity, but a business of time; a steady, lasting, popular, and uninterrupted work. They have attempted to free it from the artifice, and humours, and passions of sects; to render it an instrument, whereby mankind may obtain a dominion over things and not only over one another's judgements. And lastly, they have begun to establish these reformatations in philosophy, not so much by any solemnity of laws, or ostentation of ceremonies, as by solid practice and examples: not by a glorious pomp of words; but by the silent, effectual, and unanswerable arguments of real productions" (Sprat, 1667 pp. 62, 63).

6. Equality of men

The elements of continuity between the so called hermetic tradition and the natural philosophy of the XVIIth century, cannot lead us to neglect the difference between the new image of man of science and that of the magician-priest theorised by Ficino or that of the magician as titanic being, presented by Agrippa.

It is hardly accidental that the attack on the obscurities of magic, the illusions of the alchemists, the deception of astrology, are to be found in all those writers who, for various reasons, may be numbered among the champions of the scientific revolution. The scornful silence of Galileo and Descartes, Bacon's aggressive attack, Gassendi opposition to Robert Fludd, Mersenne's long struggle against the practitioners of the occult, Boyle's ironic comments on Paracelsus' followers, Pierre Bayle invective against the "shameful superstition" of astrology are revealing. Different people from varying points of view all cry out against a mystical world picture and appeal for greater linguistic clarity, for models that can be checked and experiments that can be repeated (Rossi 1975, pp. 247-74).

Marine Mersenne, the indefatigable "secretary of cultivated Europe", put the radical antimagic and antioccult idea of equality of intelligences into a striking maxim: "each man contains within himself all that is needed to philosophise and reason on all things"(Mersenne 1634, pp. 135-36).

Even though historians of political thought have not always realised it, the thesis of equality of intelligence in face of scientific truth had strong political implication. The distinction between masters and servants is, according to Hobbes, completely artificial and do not derive from a difference in intelligence. Many philosophers have transformed a factual difference into an ontological one: "The inequality that now is, has been introduced by the laws civil. I know that Aristotle... maketh men by nature, some more worthy to command, meaning the wiser sort, such as he thought himself to be for his philosophy; others to serve, meaning those that had strong bodies, but were not philosophers as he; as if master and servant were not introduced by consent of men, but by difference of wit: which is not only against reason; but also against experience" (Hobbes 1839-77: III, pp. 140-41).

All human beings, Samuel Pufendorf said, "have within them a principle for self-government, and all men are intelligent beings in their susceptibility to obligations: I cannot be persuaded that the mere face of natural excellence is sufficient to give one being the right to impose any obligations on other beings, who have, just as he does, an internal principle for governing themselves". (Pufendorf 1672, I, p. 2)

The notion of equality of men before the truth implied a renunciation of the image of a clear separation between philosophers and vulgar people, like beasts, for whom tales of miracles, angels and devils were appropriate. Such people required fables, as Pietro Pomponazzi, wrote, "to induce them to good and preserve from evil, as one does with children with the hope of rewards and the fear of punishment" (Pomponatius 1567, pp. 200-8).

After the age of Bacon and Descartes, Hobbes, Mersenne and Galileo, all form of knowledge that theorised secrecy in the name of inaccessibility, that envisaged “super-human difficulties” on the path to knowledge, or that stated that only initiates could know the truth and only the few could reach the *episteme* became irremediably and structurally connected with the political notion that the commonality were unable to govern themselves unaided and, like children, needed fables that kept them from the truths.

When ambiguity and enigmatic language become essential to a philosophy or when philosophy painstakingly avoids linguistic clarity or explicitly condemns clear expression as superficial or mere good sense, when the affirmation of a Hidden Wisdom of the Origins and the image of a Truth at the Beginning of Time become major, guiding ideas in a philosophy, when philosophers theorised a difference of essence between the *Shepherds of Being* and those who remain forever confined within the temporality of daily experience, capable of intellect, but totally incapable of Thought, when, finally, all this occurs at one time (as, in our century, among many Heidegger’s followers) then the hermetic tradition reveals its unspent force and celebrates a belated triumph.

7. Antiscience and new magic

I think that it was right (as occurred in the last fifty years) to reject a history of science that described its development in a triumphant key, as a linear process of progressive growth and to emphasise, on the contrary, the tortuous, non-linear and by no means inevitable nature of the historical process of science. It was important to decry an autonomous and "separate" conception of the history of science and to emphasise the presence of philosophical ideas, and religious myths in the development of science. But things did not stop here. The destitution of the positivistic image of science and its history has been made to coincide with a crisis involving the entire rationality of science. The theory that scientific thought does not develop along separate lines has been made to coincide with a denial of the relative autonomy of scientific theory. The theory that the histories of scientific thought and philosophy cannot be separated has been identified with the theory that the history of science is nothing more than the history of world-pictures. The theory that scientific theses are conditioned by extraneous elements to the thought processes (for example, a given image of science, which mirrors the culture of a given period) is now taken to mean that a rational analysis of theories is no longer possible. The recognition of the existence of a whole series of problems and difficulties has been transformed into a string of impossibilities: since experiment no longer plays the decisive function attributed to it by inductivism, then science contains only theories; since a linear and continuous development is absent from science, then only a series of "choices" between theories remain; since any attempt at a reconstruction on rational lines stumbles on elements that cannot be reconstructed, then one is left with appeals to individual or collective psychology. The history of mankind is full of myths, of religious and metaphysical ideas, of conjectures, of daring hypotheses, and of modes of perceiving and understanding the world that will never be integrated into science. In other cases, however, some of these myths, hypotheses, conjectures, influence science and become an

integral and component part of science: they "dissolve" into science. They become difficult to recognise and operate within science, in such a way as to defy philosophical interpretation and attempts to explain their presence. Should a recognition of these "hidden presences" allow us to reduce the whole structure of scientific knowledge to these elements and to dissolve it into them? Biography and psychological history may be able to reveal the motives and unconscious roots of the creative processes of thought. An understanding of these hidden presences can help us to understand Newton, they can also serve to throw light on certain aspects of his scientific thought, and they can help us to see some aspects that we might have missed or underrated. But once we have described the Newtonian concept of absolute space as his personal answer to the threat of cosmic anxiety, the inescapable fact remains that this concept is made up of mathematical, physical, theological and philosophical elements that can hardly be reduced to psychology or entirely explained by it. It appears important to recognise the variety of levels and planes in all forms of historiography. Many men have felt weak and insecure in childhood, many have been imbued with a sense of predestined mission, many have identified God with the "absent father" figure without building a system of natural philosophy. Similarly, many twentieth-century writers had phobias and anxieties, but only Svevo sat down and wrote *The Conscience of Zeno*. Explanations of Newton's and Svevo's neuroses may well be part of the story, but they are not the whole story. The "cultural objects" created by Newton and Svevo do not appear in history exclusively as products of their neuroses. The recognition of the "hidden presences" of the hermetic tradition within the modern science does not entitle us to reduce the latter to the former, and to forget that in the case of the history of science—at least from the age of Galileo it is justifiable to speak of theories that are more or less rigorous, have greater or less explanatory and/or predictive power, and are verifiable to a greater or lesser degree.

When we speak of a revolution with regard to the birth of Baconian and Galilean science, I believe we should underline the emergence, as in all other revolutions, of something new that cannot be entirely explained by what was before. Why neglect the obvious? This revolution gave rise to an historical process that has transformed the world in quite a different way from either religion or philosophy. Science and technical skills are responsible for the first attempts at a cultural unity of the world. Some methods of knowing and controlling nature tend, from the moment of their inception, to become the common property of mankind. The problem, which is mainly political, of the uses of science cannot be reduced to appeals to a freedom that could be reintroduced into history after the human intellect has been destroyed.

Some cultural anthropologists, as well as some philosophers of science of our century have accepted the idea of an absolute equivalence not only of all forms of culture, but of all possible world-pictures as well. Enthusiasm for the new magic is today rampant. Many and many authors contrast the extraordinary possibilities of a new magical world picture with the narrow rationality of science, since science "blunts our sense of marvellous", while Shamanism offers a new, freer culture. A return to the archaic phase of magical experience is today accepted by many of our students as a valid method of freeing ourselves from the sins of our civilisation.

The study of interconnections between hermeticism and modern science have greatly enlarged our historical horizon. But I think that it is one thing to become aware of the origins of our own civilisation, and another to renounce our intellectual faculties, praise Shamanism, and cultivate the occult and the prophetic as a new and superior form of knowledge.

The history of science, and more explicitly the history of the first scientific revolution, can help us to understand how logical rigour, experimental control, the public character of results and methods, and the very structure of scientific knowledge are not perennial facts of the history of mankind, but historical advances which can easily be lost.

A recognition of the troubled waters at the origins of the modern science, an awareness that the birth of scientific learning is not quite as aseptic as the men of Enlightenment and the positivists naively assumed does not imply a surrender to primitivism and the cult of magic. Many philosophers of our time contrast the extraordinary possibilities of a new magical world-picture with the narrow rationality of science, since science "blunts our sense of the marvellous" while Shamanism offers a new, freer culture.

Only if we are read to renounce a portion of our childish longings, as Freud observes, can we learn to accept that some of our aspirations will turn out to be mere illusions. It seems to me that some students of hermetic tradition have undergone a process not unlike that of many readers of Freud who, once they learn the existence of the unconscious and the influence of aggressive drives at work behind the respectable veneer of civilisation, come to the conclusion (unlike Freud himself) that neither reason, nor civilisation, nor science exist.

Must disillusionment necessarily coincide with a desire for regression?

BIBLIOGRAPHICAL REFERENCES

In my text, I have used four pages translated into English by Cynthia De Nardi Ipsen from my book *La nascita della scienza moderna in Europa* (Roma-Bari, Laterza 1997; Engl. transl., Oxford Blackwell 2001). Of this book, there is also a French translation (Paris, Ed. de Seuil 1999) (P.R.)

AGRICOLA, G., *De re metallica*, ed. by H. C. Hoover and L. H. Hoover, New York, 1950.

AGRICOLA, G., *De l'arte dei metalli*, Basileae, 1563.

AGRIPPA, C., *Opera omnia*, Lione, 1550 ca., 2 voll.

BACON, F., *The Works of Francis Bacon*, ed. by R. L. Ellis, J. Spedding, D.D. Heath, vol.7, London, 1887-1892.

BIRINGUCCIO, V., *The Pirotechnia of Vannuccio Biringuccio*, ed. by C. S. Smith and M. Teach, New York, 1941.

- BONO DA FERRARA, P., *Introductio in artem chemiae*, Montisbeligardi, 1602.
- COMENIUS, G. A., *Opere*, ed. by M. Fattori, Torino, Utet, 1974.
- Corpus Hermeticum*, ed. A.D. Nock e A.-J. Festugière. Paris, Les Belles Lettres, 1945-1954.
- COUTURAT, L., *Opuscules et fragments inédits de Leibniz*, Paris 1903.
- DESCARTES, R., *Oeuvres*, ed. by C. Adam e P. Tannery, Paris, Cerf, 1897-1913.
- DESCARTES, R., *Descartes' Philosophical Writings*, ed. by N.K. Smith. London, Macmillan & Co., 1952.
- EAMON, W., *Science and the secrets of nature: books of secrets in medieval and early modern culture*, Princeton, Princeton University Press, 1994.
- FARRINGTON, B., *The Philosophy of Francis Bacon : an Essay on its Development from 1603 to 1609 with new translation of fundamental texts*, Liverpool, Liverpool University Press, 1964.
- GILBERT, W. *De Magnete*, a cura di P.F. Mottelay, New York, Dover, 1958.
- HOBBS, Th., *English Works*, ed. by W. Molesworth. London, John Bohn. 1839-77.
- LEIBNIZ, G. W., *Samtliche Schriften und Briefe*, Darmstadt, 1923.
- LEIBNIZ, G. W., *Die philosophischen Schriften*, ed. by C.I. Gerhardt, Berlin, 1875-1890, 7 voll.
- MALDONADO, T., *Il brevetto tra invenzione e innovazione*, in "Rassegna", XIII, 1991, pp. 6-11.
- MERSENNE, M., *Questions inouyes ou récréation des sçavans*. Paris, J. Vallery, 1634.
- NEWTON, I., *Il sistema del mondo e gli scolii classici*, a cura di P. Casini, Roma, Theoria, 1983.
- PARACELSUS, *De summis naturae mysteriis commentarii*, Basel, 1584.
- PERRONE COMPAGNI, V., *Picatrix Latinus: concezioni religiose e prassi magica*, in "Medioevo", I, 1975, pp. 237-337.
- POMPONATIUS, P., *Opera... De naturalium effectuum causis sive de incantationibus*. Basileae, [s. n.], 1567.
- PUFENDORF, S., *De jure naturae et gentium*. Londini Scanorum, sumptibus Adami Junghans imprimebat Vitus Haberegger. 1672.
- ROSSI, P., *Hermeticism, rationality, and the Scientific Revolution*. In *Reason, experiment, and mysticism in the Scientific Revolution*, ed. by M.L. Righini Bonelli and W. Shea. New York, Science History Publications, 1975.
- SPRAT, Th., *The History of the Royal Society of London for the improving of Natural Knowledge*, London, 1667.
- VAUGHAN, T., *The magical writings of Th. Vaughan*, ed. E. Waite, London, 1888.
- WESTFALL, R. S., *Never at rest. A biography of Isaac Newton*, Cambridge, Cambridge University Press, 1980.