THE THREE TRADITIONS IN SCIENCE AND THE WRITINGS OF SWEDENBORG[1]

Linda Simonetti Odhner

The growth of science, according to Hugh Kearney in his book *Science and Change, 1500-1700*[2], can be seen in terms of three traditions which he calls the organic, magical, and mechanical. First I shall briefly describe them and trace their paths through history, then show how they relate to one another, and finally examine them in relation to the view of the universe expressed in the theological Writings of Emanuel Swedenborg.

The Organic Tradition

The organic tradition had its roots in the work of Aristotle, and was based on the observation of physical phenomena. "Within the organic tradition the scientist explained the natural world in terms of analogies drawn from what we now call biology. The language which he used originated in the observation of growth and decay, with the analogy of the acorn growing into the oak always ready to hand" (p. 23). According to this view change is the only constant thing we can observe; but the universe is bound together by purpose. Everything has a use, and the order we see is the result of a unifying final cause. This point of view leads almost inevitably to a study of living things; these are the most highly organized things we experience directly, and they exhibit the Divine purpose most clearly (p. 23). Aristotle's reasoning often took the form of the syllogism, the instrument by which he moved from empirical observation to general principles, sometimes too boldly. "Aristotle and his followers could not resist systematizing and generalizing on a slender basis" (p. 33). Some results of these generalizations in physics and astronomy were the concept of the four elements constituting matter; the earth's location at the center of the universe; the dichotomy between the sublunary and translunary worlds, with the resulting distinction between circular and rectilinear motion; and the emphatic refutation of atoms with their materialistic connota-

[1]The original version of this paper was presented in partial fulfillment of requirements for a History and Philosophy of Science course at The Academy of the New Church College.

[2]Hugh Kearney, *Science and Change, 1500-1700,* McGraw-Hill, 1971. All page numbers in text refer to this book.

tion. Among those who followed Aristotle in propounding the organic view Kearney includes Galen (c. 130-201) the Greek physician, Ptolemy (c. 139-161) the Alexandrian astronomer (who, unlike most in the organic tradition, was an accomplished mathematician), and centuries later, Harvey *(1557-1657)* the physician who discovered the circulation of the blood, Francis Bacon (1561-1626) the scientific philosopher, and Malpighi (1628-1694) the physiologist. In the organic tradition, mathematics remained in the background; the emphasis was qualitive, not quantitative.

The Magical Tradition

The magical tradition became widely known from the works of Plato (427-327 B.C.), but its roots go further back in time. Much of the mathematical aspect of it originated with Pythagoras (582-500 B.C.) and his followers, while in medieval times the works of the legendary Hermes Trismegistus—the supposed author of works claiming to expound Egyptian wisdom—were considered to be, or lead back to, its source. In the magical tradition nature was seen as a work of art and God as the Divine Artist. The universe was a riddle, in which a chosen few could learn the secrets which would unlock the untapped power of the universe. Some followed Plato's example in stressing the world beyond change, seeing mathematics as a manifestation of its certainty and perfection. Those who dealt in magic saw themselves emulating the Creator and gaining insight into the Divine Artist's mind. Some ideas stemming from this tradition were that the sun was the center of the universe and a symbol of God; that light is the source of life; that there is a mathematical harmony in the universe (p. 34); that there is a parallel between man, the microcosm, and the universe, or macrocosm; and that physical things are not real and we must look beyond surface phenomena for truth. Many of these ideas belonged to the New-Platonic movement founded by Plotinus in the third century A.D.; and among later New-Platonists were Copernicus (1473-1543) and Kepler (1571-1630).

Mathematics was extremely important in the magical tradition and amounted to religious contemplation. Everything had a soul which was the source of its being, matter being an incidental limitation. "The Neo-Platonic soul was imprisoned in the material world; the Aristotelian soul was an informing principle" (p. 40). While those in the organic tradition embraced the natural world, the mystics whose view of nature reflected the magical tradition were always trying to get beyond it.

The Mechanical Tradition

The mechanical tradition in modern science appears to spring from Archimedes (287-212 B.C.), the great Greek mathematician and engineer. In this tradition "the dominant analogy was the machine" (p. 24). The regularity and predictability of the universe was stressed. Natural laws were unchanging and could be expressed in mathematical terms; thus the mechanistic approach was essentially quantitative. The mechanical tradition was not, in general, associated with philosophical views—the point was to divorce science from philosophy, to deal only with the physical world and to generalize exclusively from physical, measurable phenomena. The atomic view which originated with Democritus (c. 460-370 B.C.) was associated with the mechanical tradition, especially after Toricelli's experiment in 1644 showing the existence of a vacuum (pp. 74 & 172). Although Democritus[7] atomic theory carried a connotation of materialism, and thus was unacceptable to those who believed in a reality beyond the senses, with the mechanists it was not associated with any particular philosophy, materialistic or not. It was not that the mechanists did not believe in God—Galileo and Descartes both did—but they regarded religious questions as irrelevant to science. God may be the Divine Engineer, but we cannot gain real insight into how He operates. As Descartes put it in his *Principia,* "We ought not to presume that we are sharers in the counsels of the Deity" (p. 160).

Some Reflections on These Traditions

Although Kearney admits that these three traditions in science—the organic, magical, and mechanical—overlap, he stresses their separateness and essential incompatibility. I was much more impressed by the fluidity of the bounderies between them, and the way they complement, rather than contradict, each other. Kearney regards Archimedes as totally different from both Plato and Aristotle. He says: "There was an immense gap between the approach of the magical tradition [represented by Plato] and the detached intellectual curiosity of Archimedes....[He was] not searching for mathematical harmonies of a religious significance" (pp. 46-47). But I hold to my idea that there is a deep kinship between Plato and Archimedes. They were both dealing with ideal realities; Plato thought about them, and Archimedes thought from them. At that time, the "religious significance" of mathematical harmonies as seen by Pythagoras was not really distinguishable from their scientific

significance. Both science and religion were represented in the same philosophy.

The line between magical and mechanical mathematics is a fine one, but it can be drawn. The confusing point is that it must be drawn at two levels—motivation and method—and these two distinctions do not always coincide. The work of Kepler illustrates this ambiguity.

Kepler had strong mystical leanings, a large investment in the harmony and beauty of the universe, and a tremendous desire to search out, illuminate, and taste that beauty himself. He was not content merely to speculate, as many mystics were; he had to know. He knew that harmony was there, in the motions of the heavenly bodies, if only he could see it. And so he kept his speculations, for the most part, on a course straight and true, by testing them against the painstaking and accurate observations of his colleague Tycho Brahe. Kepler's motivation stemmed from magical philosophy, but his methods were often, though not always, compatible with mechanistic validity.

The fruits of his unceasing labors were these: a contrived system of nesting the five Platonic solids between the planetary orbits, which seems to us to have no claim to importance; and three powerful mathematical generalizations about the planetary motions which proved absolutely essential to the all-encompassing mechanical synthesis of Newton. We have seen that the motivation for all these endeavors was the same. How did the methods differ?

When he incorporated the Platonic solids into the workings of the solar system, Kepler was imposing a mathematical construct on an existing system of phenomena over and above what was already there, trying to bring together two diverse entities. This represents the essential qualities of magical mathematics: intuition, imagination, with overtones of mystery and a naive concreteness, and above all, analogy. One might even say it has a feminine quality. In the magical view, numbers and forms have an intrinsic significance. In this case the numerical preoccupation misled Kepler, for three of the nine planets had not yet been discovered, and the assumption that there were six was one of his main supporting arguments for this particular model.

Kepler's three laws, in contrast to this, add nothing to what was already there in the heavens, but rather draw out existing relationships, and display a more purely logical line of thinking. However, they too are examples of Kepler's intuition and creativity—qualities which are necessary for all mechanistic insights. Both the mecha-

nists and the mystics were trying to find the mathematical order of the universe, and they built on each other's findings.

What the organic and mechanical traditions have in common is logic—the organic tradition used verbal logic, which has some give to it, and the mechanists stuck to mathematical logic as the only reliable kind of reasoning. Both also based their assumptions on observed phenomena, but not the same ones, so they did not arrive at the same conclusions.

The complementary relationship between these three traditions can be seen more clearly if they are equated with the New Church ideas of love, wisdom, and use. The magical tradition is the love element; it is intuitive and esthetic. It uses analogy which is an intuitive type of reasoning. The mechanical tradition is the translation into science of wisdom; it is above all rational, mathematical, general, and abstract. (In this light, Kepler's work is seen as a powerful union of love and wisdom.) The organic tradition, being the only one which really comes to grips with ultimate reality, with all its perishability, idiosyncracy, complexity, and unexpectedness, is the element of use; it stresses the purpose and interrelatedness of everything. Love, wisdom, and use are all necessary to the operation of the universe, and in the same way a complete view of the universe partakes of all three traditions.

Kearney says that the view that God is an artist and the world a work of art is "clearly incompatible" (p. 196) with the view that God is an engineer and the world a machine. But he doesn't say why God can't be both an engineer and an artist. If He is infinite and the source of all variety, why not? We are all equally made in His image.

The Three Traditions in Relation to Swedenborg

Elements of these three traditions in science can be seen in the theological Writings of Emanuel Swedenborg. There are two main reasons for this. The most obvious is that Swedenborg was influenced by his scientific and philosophical heritage, and the knowledge he acquired in these fields served as a vessel for his own reception of revealed truth. Another explanation is that these three traditions, particularly the magical, were built on corrupted remnants of true knowledge which the Ancient Church possessed about correspondences. What the Ancients knew and what Swedenborg knew was truth revealed by God—and truth is constant.

Let us look first at the magical tradition in relationship to the Writings. The doctrine of correspondences is central to the teachings which Swedenborg set down, and suggests the all-pervading

analogies of the magical tradition. The other ideas in the Writings which we would call magical all follow naturally from this doctrine. That there is an internal sense to the Word, which treats of the life of the Lord and man's regeneration *(Arcana Coelestia),* means that the events and objects in the Old and New Testaments have a symbolic meaning beyond their apparent significance; and symbols were part of the magical tradition. The very existence of the spiritual world fits in with magical beliefs, as does the belief that there is a correspondence of all things of creation with man, which harks back to (or should I say, originated?) the microcosmic belief. *Arcana Coelestia* 6319 sums up the effect of correspondence on man's nature: "...the nature of the intercourse of the soul with the body...is such as is the influx of the spiritual world into the natural world; for the soul or spirit of man is in the spiritual world, and his body in the natural world; thus it is according to correspondences." And the idea that the true essence of everything is spiritual, not natural—especially that man's true being is his soul—was assumed without question by the mystics who thought within the magical framework.

The correspondence of the natural sun with the spiritual sun, which is the Lord, seems to be recognized by the mystical thinker Copernicus, who refers to the sun as ' "the Lamp, the Mind, the Ruler of the Universe...the visible God" ' (p. 100).

One final thing that reflects the magical tradition is the significance of numbers in the Writings. Three and seven represent states of completeness; ten is remains; forty a state of temptation. Pythagoras did not make these particular interpretations, but he did ascribe an intrinsic meaning to numbers.

The organic tradition is also well represented in the Writings, especially in the doctrine of use. All things in the natural and spiritual worlds have a use which looks to man and embodies the human form *(Divine* Low V). Swedenborg expresses the relationships in the universe in a hierarchical way—prior and posterior, interior and exterior—reminiscent of Aristotle. Everything has its place in the universe, which is determined by its function. Swedenborg's line of reasoning also owes something to Aristotle's logic.

The sequence of end, cause, and effect definitely belongs to the organic tradition, in which the function of a thing is determined by its purpose, and its mechanism depends on the function. This is the way Galen looked at living things.

The Aristotelian concept of rational, animal and vegetable souls is reflected in the three natural degrees of the human mind, of which animals have the second degree and plants merely the lowest. The

cause of the body's organization is the soul, which is universally present in the body by means of the blood. The Writings call the blood the "ultimate soul" or "corporeal soul" of man (AC 1001:5). Aristotle and Galen mention a "vital spirit" contained in the blood which embodies the soul.

Swedenborg uses a lot of biological analogies, especially concerning reproduction, to illustrate his doctrinal points—nature's fecundity reflects the infinity of God, for example. And images of generation and corruption were the basis for understanding the world from the organic point of view.

The doctrine of the Grand Man of Heaven—that heaven is in the form of a man (HH 460) and that each organ corresponds to a particular human use and especially that the heart represents the will and the lungs the understanding as shown in *Divine Love and Wisdom*—reflects elements of both the magical and organic traditions. These two traditions seem to be in some agreement regarding the place of the soul in nature, although the organic view implies a more intimate relation between them.

The mechanical tradition is not well represented in the Writings. The most important reason is that the mechanical view consciously leaves out questions of philosophy and theology, dwelling exclusively on the evidence of the senses and abstractions therefrom. The central place of man in the universe is not specifically acknowledged, and indeed inanimate things are preferred as objects for study. These are the kinds of knowledges which can support truth and falsity equally well, according to the Writings.

Swedenborg's pre-theological physics was highly speculative; he didn't go in for experiment, and I don't believe he was especially interested in mathematics. There is one interesting mathematical analogy in the Writings in *Divine Providence* 335: man approaches the wisdom of God asymptotically to eternity, as one arm of a hyperbola approaches a straight line.

Another reason for the lack of mechanistic elements in the Writings is the nature of the Old and New Testaments. The beginning of the Old Testament has the symbolism of the Ancient Word; the rest is history, poetry, prophecy—about people, not things. And furthermore, the Writings stress qualities, not quantities; perception, not experimental proof; love acting through wisdom, not wisdom alone.■