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THE WORLD MACHINE—EMANUEL SWEDENBORG'S NATURAL PHILOSOPHY*

David Dunér†

INTRODUCTION

I will begin with a thought experiment. If I mention the years 1688 and then 1772, what do you then visualize? Between these we can put 1745, which is for many of us of special significance. If you think about it for a while, what comes then into your mind? I would guess that you imagine it like a line between 1688 and 1772, the line of life, or the thread of life. Perhaps this line bends and turns, and has a distinct angle at 1745? Am I right? My research on Swedenborg takes its departure from this kind of cognitive phenomenon, that we imagine something in terms of something else. For example "time" is like a line, "life" as a journey, "thinking" as a journey. This is the metaphorical mind. Metaphors have a crucial, central role in the human mind. In this human ability, perhaps no one has reached so far as Swedenborg. In this lecture I will present some of Swedenborg's metaphors in his early science. The central metaphor is the metaphor of the machine.

In his early scientific career, Swedenborg thought that the world was like a gigantic machine, following the laws of mechanics and geometry. The world is a machine. Everything could be explained in terms of geometry in action. In 1734 he published two major works, which form the peak of his mechanistic philosophy, *The Principia* and *The Infinite*. After 1734 he left the mechanistic explanations and turned to an organic worldview, and

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some years later, in 1745, he entered the spiritual world. Up to 1734 the machine metaphor is the central metaphor that make him understand nature in terms of machines. Everything is machines: the planetary system, the particles, the human body, the brain—he talks even about a "soul machine." All this has its departure in the Cartesian distinction between matter and motion. Everything in nature can be explained by these two concepts.

However, in my research on Swedenborg's early natural philosophy I have tried to explain Swedenborg's thinking in a new way. The question is not only what he thought, but also *how* he thought. I have tried to understand his ideas and thoughts on a cognitive level, how he used human cognitive tools such as mental images, the storing of knowledge, communication, the construction of idealized models, categorization, and the use of metaphors, mythological associations, and pictures. This perspective may even cast new light on his spiritual philosophy and doctrine of correspondences, which is, from my point of view, very much a metaphorical system based on cognitive abilities and experiences.

The human mind creates concepts of the invisible and unknown with the aid of the visible and known. Philosophers and scientists often describe their reasoning and research as something spatial, like a walk in a labyrinth or a voyage on a dangerous ocean. An excellent example of this metaphorical conceptualization is the mechanistic natural philosopher and theologian Swedenborg. Few authors in the history of thought have used metaphors in such a far-reaching manner as he.

SPACE

With this mechanical worldview, geometry took on a central significance in his philosophy. Mechanics is in fact, as he puts it, "geometry in action." So a great part of his early philosophy concerns the identification of geometrical forms in nature. The geometrical figure gives clues to the qualities and effects of matter.

Swedenborg's natural philosophy is characterized by the idea that geometry is an ideal method of obtaining certainty, and is of an ideal objectivity belonging to a transcendent reality. Geometry stands for cer-

tainty, truth, clarity, objectivity, and orientation. For example, Swedenborg's manuscript *Geometry and Algebra* is of unusually high standard compared to his other mathematical writings, for example *Regel-konsten* (The rule-art treated in ten books) published 1718. It turns out, after a mathematical analysis, that this manuscript is based on a textbook by the French mathematician Charles Reyneau, *Usage de l'analyse*, from 1708. And furthermore, Swedenborg's own copy of it is still preserved in Stockholm, with his own marginalia. This book he bought in Paris, in September 1713. I conclude that Swedenborg's manuscript was written in 1713–1714, and perhaps he also had another great mathematician as supervisor, Pierre Varignon. That could, maybe, explain the high standard of his mathematics.

THE SIGN

When Swedenborg had returned home and become assistant to the great inventor Christopher Polhem in 1716, a rather amusing debate evolved among Swedenborg, Polhem and the Swedish king, Charles XII. During the years 1716 to 1718 they discussed number systems based on 8 or 64 as an alternative to the traditional decimal system. The king proposed a new system of reckoning with the base 64 instead of 10, a number that includes a square and a cube. On royal demand Swedenborg constructed then a system with the base 8. He invented new symbols and names. When someone says "lalelilolulyl," that is another way of saying 299 593. Swedenborg dedicated in 1718 his presentation of the system, *En ny räkenkonst* (A New System of Reckoning which turns at 8), to the king. A year after the king's death—Charles XII was shot in a battle in Norway—he published a pamphlet that instead strongly advocated for the decimal system. What happened? Did he change his mind? Maybe this arithmetical study shows that even mathematics is not free from political and rhetorical considerations. It also shows his interest in the classification of the world by categories in number systems, coinage, measures, weights, and volumes, which later develops into his universal mathematics and theory of correspondences.

THE WAVE

During these years he was also interested in the force of water waves. Swedenborg used the metaphor of the wave not only in such scientific disciplines as hydrology, acoustics, optics, and neurology, but also in poetry and music. On the basis of his daily life experiences of water waves, Swedenborg could use this metaphor to transfer the qualities of these waves to other physical phenomena such as sound waves and light waves. During the 1710s he was occupied with the question of how water as a mechanical force could shape the landscape. He found shells, bones of a whale, far away from the sea. He concluded that there had existed a primeval ocean and interpreted the landscape in geometrical terms.

In the first issue of his scientific journal *Dædalus Hyperboreus* (1716–1718), he published six articles on acoustic instruments and experiments in acoustics. The common theory was that sound consisted of waves in the air. Swedenborg performed an experiment on echo, based on that theory, trying to estimate the speed of sound. Beside the physical interest in sounds, the scientists in the circle around Swedenborg were all amateur musicians and keen lovers of Baroque music. Perhaps the intertwined compositions of the fugue have similarities with Swedenborg's natural philosophy. Concerning fire and light—even light consists of waves—Swedenborg and Polhem had a fierce debate in 1722. A manuscript on this subject, *Om eldens och fergornas natur* (Fire and Colors), which has until now been dated 1717, turns out to have been written in 1722 as an answer to Polhem's theory on fire. Swedenborg criticizes his analogical method curiously enough. He himself used that kind of reasoning very often.

One among Swedenborg's most original ideas was put forward in a manuscript of 1720, *On Tremulation*. He maintained that life consists of waves or tremors of the nerves. To live is to shiver, he says. The body is like a musical instrument. He was a typical follower of iatromechanics, describing the body as a machine with pumps, levers, bellows and so forth. Of special interest is his use of the metaphor of the circle. There are many different kinds of circulations in the body, such as the blood circulation and respiration, which are parallels to the planetary motions. Even thoughts and feelings may travel through the air in waves. One membrane tremulates by another. In youth the membranes are soft, manhood is the

best time for transferring the shivering, and in old age the membranes and strings of the body become stiff and fragile. So we can here see how Swedenborg goes from concrete water waves to abstract mental waves.

THE SPHERE

It is obvious that Polhem's natural philosophy influenced Swedenborg a lot. Swedenborg maintained, as Polhem did, that nature is structured in analogies and proportions. In his early theory of matter put forward in *Principles of Natural Things* and *Miscellaneous Observations* from 1721–1722, he declared, in accordance with Polhem, that the sphere, like the round form of peas, cannon balls, and bubbles, can give clues to the structure of the invisible world of particles. Swedenborg's own theory, the bullular hypothesis, states that particles are like bubbles with a surface with other bubbles on it, and these in turn bear other bubbles, and so on right down to the mathematical points. The form of the water bubble can also explain the steam engine.

During these years he was occupied with chemical problems. For the mining industry he wrote a paper on new ways of finding mines, where he suggested that the surveyor should look for effluvia or exhalations with the help of a divining rod. In the 1720s he began, as an assessor in the Board of Mines, a huge work that attempted to describe the whole mineral kingdom. He wrote on sulphur, copper, silver, salt and magnetism. In 1734 he published two books, *On Iron* and *On Copper*, which show metaphors and a geometrical natural philosophy. Behind his analogical reasoning there is an assumption that "micro mechanics is macro mechanics." The experience of artificial machines made by humans could be transferred to the invisible microcosmic world of particles. There is no difference between the small and the big world.

THE POINT

In Swedenborg's *The Principia* from 1734 the mathematical points are given a special significance. The world appears when God, like an artist drawing with his pencil, gives motion to the point. The world consists of circulating points. With a spider metaphor Swedenborg postulated that

the world is built on mathematics, and with labyrinth metaphors he formulated the philosophers' feeling of disorientation in the chaos of nature. The mind is often described as a journey in a labyrinth in darkness, striving to find the plan of the labyrinth and to see the light. Behind this is a conception of the creation of the world as an exercise in geometry. The world is geometry. Around 1730 he had begun sketching a second version of a theory of matter, in the work commonly called the *Minor Principia*. It differs considerably from the published work of 1734, *Principia*. In 1730, however, he had still not come across the philosophical terminology of the German philosopher Christian von Wolff. In the printed *Principia* we first find Wolffian terminology, such as "finitum," "active and passive," "conatus" et cetera.

THE SPIRAL

One figure has an exceptional appearance in *Principia*. That is the spiral. The spiral is Swedenborg's most admired geometrical figure. He wrote about the windings of the spirals in geometry, particle physics, astronomy, and in the nature of the soul. In his mathematical writings he treated the geometry of the logarithmic spiral, and in several astronomical writings he described the eternal spring of the world caused by the spiral movement of the earth. In *Principia* he goes further: particles and planets circulate in perfect spirals. And finally, he also made a sketch of a membrane between body and soul in the form of a spiral. Through all this there is a micro- and macrocosmic perspective. Macrocosm is in the microcosm. The world of particles could be conceptualized as small solar systems. The experience of water and air whirls is developed to an abstract world of solar vortices and points in spiral motion. Swedenborg was a follower of the Cartesian vortex theory, and neglected Newton's gravitational theory.

INFINITY

Swedenborg's last mechanistic work was *The Infinite*, published in 1734, where he made a strict distinction between the finite and the infinite. The infinity is God in contrast to the finite man and the material world.

Only God could be infinite, everything else is finite. His thoughts on infinity give a picture of his metaphysics, of how he tried to connect science and theology, man and God, reason and faith, before he turned to organic metaphors. He tried to find out the limits of human reason: what things it is possible to have knowledge about. The existence of God is also demonstrated by a cosmological argument that the infinite is the first and last cause of the finite. In another argument, the physico-theological argument, he tried to demonstrate that the order and perfect machinery of the human body demonstrates that there is an infinite creator behind it.

CONCLUSION

After 1734 he turns to an organic worldview. The world could be conceptualized as something with life, growing and organic. It is not a lifeless machine. But his fascination for geometrical figures lives on, for example in his doctrine of forms, and series and degrees, and universal language. Then in 1744 his famous dream crises changed his direction in life. After 1745 he developed, as you know, his theory of correspondence and began working on his huge commentary on the Old Testament. You may say that his spiritual world and his theory of correspondence are in fact a system of metaphors. He used those human cognitive abilities as he did as a scientist. His correspondences are not arbitrarily chosen. His philosophy is based on primary, general metaphors shared by all humans, such as love is heat, bad is stinking, similarity is closeness, states are places, aims are destinations, and many more. Swedenborg advanced the ability to think in metaphors further than anyone else has done. He discovered the metaphorical mind. ❑