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Swedenborg's Spiral

by David Dunér

Its curve twists more and more around something,

like a snail, although always further from its center,

thus, to be drawn.. Emanuel Swedberg, "Om en boglinia eller curvâ, hwars skärlinier thet är secantes giöra altid med boglinien lika wincklar," in *Daedalus Hyperboreus eller mathematiske och physicaliske försök/För aprilis, maji, junii månader 1717* VI (Skara, 1718), 14. Although the text makes references to pictures, these are missing in the article.

Emanuel Swedenborg, 1718

INTRODUCTION

The spiral is the most excellent and perfect of all geometrical figures. So thought the scientist and theologian Emanuel Swedenborg (16881772). "Why?" one perhaps wonders. It is possible to mathematically define a spiral unambiguously without using words that mention either excellence or perfection. And Swedenborg was, in fact, well acquainted with the spirals geometrical characteristics, as he displays in, among other places, an article in *Daedalus Hyperboreus* (1718) and in his manuscript *Geometrica et algebraica* (17131714).. *Ibid. 14ff,* "Geometrica et algebraica," in *Em. Swedenborgii Autographa Ed: Photolith*. II (Holmiae, 1870), see esp. "De lineis spiralibus," 76ff. The manuscript has up to now been dated 1719. But much more likely it was written during his stay in Paris 17131714. In September 1713 he bought Charles Reyneaus *Usage de lanalyse* (1708) and it is in fact this book which he used for his manuscript.

There were two interesting geometrical characteristics to which Swedenborg gave special attention. First, the spiral as mechanical, as for example, Archimedes spirala figure that is displayed by motion rather than by fixed points.. Archimedes, "Peri elikon," in *Greek Mathematics*, ed. Loeb, 362 (Cambridge, Ma., 1980), 182f. Second, this spiral can be said to be infinite, as is the case with the logarithmic spiral described first by Descartes in 1638. Like the circle, it is equiangular, which means that its curve can increase and decrease to infinity without changing form. The logarithmic spiral therefore always looks the same, regardless of which part of the spiral one considers. It is just this equiangular spiral that Swedenborg describes in the above-mentioned *Daedalus* article.

It is in geometry that Swedenborgs spiral takes its beginning. But from then on, it is not primarily a question of the spiral as a mathematical figurehow it can be described purely mathematically, or as a form that corresponds to some physical or biological phenomenon. What comes into focus, rather, are the spirals non-geometric characteristics, such as perfection, dignity, beauty, reason and goodness. Throughout the history of ideas geometrys forms and figures have often been associated with something outside of themselves, with something beyond their strict geometrical characteristics. The point and circle especially have come to represent perfection, infinity, eternity, harmony, wholeness, and divinity. For Swedenborg it was instead the spiral that underwent an apotheosis. Our intention, therefore, is to attempt to reach the meaning and driving force behind the supremacy of the spiral, the way in which Swedenborgs spiral can be found to have a basis in his days mathematics and physics, and in the aesthetics and perfection of forms within the natural sciences, metaphysics and pictorial art.

It becomes evident, if one follows Swedenborgs authorship, from his early mathematical manuscripts to his final theological writings, that the perfect spiral returns again and again in the most diverse contexts, even in the most unexpected ones. Most of his works actually present this figure. In his mathematical writings from the 1710s, he treats of the spirals geometrical characteristics, together with other curves, like the parabola, hyperbola and cycloid. In his cosmogony from 1734, the spiral motion becomes the perfect, fundamental figure of motion, from the spiral motion indwelling in the mathematical point to the whirling motion of the planets and stars. In his physiology and anatomy from the 17301740s the soul has the form of a spiral, and similarly the most subtle structures of the body and its processes also take this form. In addition, it is part of a hierarchy of forms, from the lowest, earthly angular form to the form of the Divine that is beyond conception. The spiral appears even in Swedenborgs theological works treating of the non-geometrical spiritual world, from his conversion in 1745 on to the time of his death. One finds evil and good spirits in spiral shapes, spiral stairways in the spirit worlds Babylon, and paradisal gardens in spiral forms.

The microcosmic spiral motion

It was from a view of geometrys outer forms that Plato, and also Christopher Polhem and Swedenborg, could understand and describe the least parts of reality. For Polhem, Swedenborgs scientific mentor, the sphere was the perfect figure, and consequently matter consisted of perfect round particles in a vacuum. However, in one manuscript he discusses the spiral motion and mentions a spiral that forms a sphere.. Christopher Polhem, "Mechanica naturalis eller naturens konstiga sammanhang framstelt under små frågor och svar af C. R. C. P.," in *Christopher Polhems efterlämnade skrifter* III (Uppsala, 19521953), 254. Concerning Polhems impact on Swedenborgs theory of matter see David Dunér "Bubblor, kanonkulor och en tunna ärtor. Polhem och Swedenborg om materiens struktur," in *Polhem. Tidsckrift för teknikhistoria,* vol. 18/19 (2000/2001), 327; or concerning Polhems, Swedenborgs, and Charles XIIs debate on numbers; cf.

David Dunér, "Sextiofyra och åtta ist ället för tio. Karl XII, Swedenborg och konsten att räkna," in *Scandia* (2001), vol. 67, 211238, 336 (summary). Polhems natural philosophy laid the way for Swedenborgs early attempt to formulate a particle theory. In a 1718 letter to his brother-in-law Eric Benzelius Jr., Swedenborg presents his conception of how geometrical proof can be transferred to particle physicsthat the round forms of air and water particles can be proven using geometry. Consequently, if one is acquainted with the geometrical characteristics of a particle, one can also draw conclusions regarding its remaining characteristics.. Starbo January 30, 1718. Swedenborg, *Opera quaedam aut inedita aut absoleta de rebus naturalibus* I (Holmiae, 1907), 281. This line of thought, that air and water particles are round, is developed later in *Prodromus observata circa rerum naturalium* (1721). The following year in *Miscellanea observata circa res naturales* the thought is put forth that the principles of nature should be the same as those of geometry, that natural particles can be derived from mathematical points.. E. Swedenborg, *Miscellanea observata circa res naturales & praesertim circa mineralia, ignem & montium strata* (Lipsiae, 1722), 132f; Engl. transl. *Miscellaneous Observations Connected with the Physical Sciences* (London, 1847), 84. The simplest figure is the sphere. But one who has been able to develop a particle system from other forms, from winding curves, serpentines, snake-like spiral forms, is very ingenious. This inventor, Swedenborg writes, would be worthy of great praise, and his discovery should be heartily welcomed, provided that it is based on mechanical principles.. Ibid. 156f; Engl. transl., 98.

He himself succeeded in accomplishing this ingenious feat. In his *Principia rerum naturalium* (1734) he declares that the spiral is the underlying figure of matter. There is no other work of Swedenborgs where the spiral plays such a prominent role. There the spiral constitutes the fundamental figure of motion in nature, the recurring sign that binds all the mechanical parts of the universe together, uniting the least entities of the particle-world with the largest structures of the universe. In *Principia,* nature is described, in the spirit of Descartes, as a machine-world where everything is geometrical and mechanical. Only God, "the Infinite," the final cause of the geometrical world, is himself something neither geometrical nor mechanical. Swedenborgs infinitely perfect geometrician creates, of course, a world where the most perfect geometrical figure is its modelthe spiral. The act of creation became a kind of expanded exercise in Euclidian geometry. At the same moment that the world was created, geometry was also born. The genesis of nature and geometry became one and the same, or in different words, the relationships of the substances of physics coincided with the spatial relationships of geometry.

First, from the Infinite, by an act of Divine will, mathematical points were created. These points lack extension but take a definite place in space and display an effort to motion or contain, in Leibnizian terminology, a conatus. Here we have two fundamental principles in Swedenborgs particle system: the point and its indwelling effort to motion, two concepts that explain all physical phenomena, similar to Descartess related dichotomy between extension and motion. Swedenborgs line of thought can further be compared with Leibnizs *lex melioris*our world that God has created is the best possible worldand also with Platos *Timaeus* dialog, where the fact of the worlds derivation from God assures its beauty and perfection. God is omnipotent and consequently he has infinite freedom to create the perfect world. Since nothing incomplete can come from an infinitely good and perfect God, it follows of necessity, according to Swedenborg, that the indwelling motion of the point is the most perfect of all motions, a motion that must be described by the most perfect and complete form.

If the perfect form is the circle, this inescapably involves that the most perfect figure of motion in the point is the perpetually-circular motion, that is to say, an eternal and unbroken spiral motion from the center to the periphery and again from the periphery to the center. This figure, not infrequently misunderstood, is seen on closer consideration to be a spiral not on a plane surface but in space, that is to say, it is properly speaking a helix, and as such, it is in a way also an impossible figure. Impossible because, Swedenborg thinks, this spiral can neither be analyzed nor demonstrated geometrically, but only understood by analogy with the geometry of finite things.. E. Swedenborg, *Principia rerum naturalium novorum tentaminum phaenomena mundi elementaris philosophice explicandi* (Dresdae & Lipsiæ, 1734), 37; Engl. transl. *The Principia*, *or the first principles of natural things, being new attempts toward a philosophical explanation of the elementary world* (London, 18451846), vol. I, 64. Swedenborgs spiral does not proceed from *one* center to *one* circumference, but from *several* centers to *several* circumferences and from the circumferences back to the centers, where the center and the circumference coincide. No experiment can confirm or prove the theory. Swedenborg concludes that there is nothing in nature that can move itself with greater freedom and facility than the spiral motion.. Ibid. 39; Engl. transl., 68.

It is precisely from the mathematical point that the whole of the *Principias* particle world is produced; all the subsequent stages of creation are included in it. The points local spiral motion gives rise to the first substance, the first or simple finite, *"primum seu simplex finitum."* This figure is the most perfect of all finite things, since it is like the perfect simple points inner conatus to motion. The figure it describes is therefore the spiral, a spiral that consists of continual, eternal circles from the centers to the circumferences and which is without boundary, end or anglethe form that is mechanical in the highest degree. Swedenborgs particle world is characterized in consequence by dynamism and indefinitude, where motion draws the figures. In this it differs from Platos unchanging geometrical atomism consisting of the equilateral polygons of the elements. Swedenborgs spiral recurs throughout the whole series of physical entities, from the first finite to the greatest constellation. The first finite, whose points move in spirals, has an equator, like the macrocosmic world, ecliptic and meridians. Similarly also, the elementary particles, which arise through a combination of passive and active particles, form whirls not unlike the macrocosmic solar whirl, and the elementary particles polar axis corresponds to the zodiacs polar axis, and its equator in turn with the zodiac of the solar whirl.. Ibid. 93; Engl. transl., 163. Cf. Ibid. 49; Engl. transl., 86. The microcosm, in other words, is of the same order as the macrocosm. In the microcosm is the macrocosm.

The macrocosmic vortical motion

When one considers the heavens, Swedenborg writes in *Principia,* the enormous number and magnitude of the stars fill one with wonderheaven is so enriched by such beautiful ornamentation.. Ibid. 122; Engl. transl., 208. Even in the ornamentation of the macrocosm, one finds the spiral to be the most beautiful of figures. But the figures in Greek astronomy corresponding to the immutable, eternal order of the heavens were the circle and the sphere, that is to say, the complete figuresfigures that have neither beginning nor end. The idea of the perfect circle took expression also in emblems and allegory. In Cesare Ripas *Iconologia* (1593), the circle and the zodiac are the sign of the Perfect and Complete, for Reason and Regularity.. "Perfettione," in Cesare Ripa, *Iconologia overo descrittione di diverse imagini carate dall antichità, di propria inventione* (1593; Hildesheim, 1970), 391f. Using a compass, an allegorical female figure draws an eternal, perfect circle.

The doctrine of the circle lived on to the time of Copernicus and Galileo. During the first half of the sixteenth century the supremacy of the motion of the circle began to diminish, since it no longer could be taken for granted, but had to be explained. This was to the advantage of Keplers elliptical planetary orbits and Descartes motion in a straight line (the second law of nature).

The Greeks perfect circles and Keplers ellipses were exchanged in Swedenborgs *Principia* for an oscillating

spiral motion. It is no longer the static-geometric symmetry of Plato that characterizes the world, but a dynamic accord or harmony. Continual changes and variations constitute the worlds perfection. However, there is also a universal application: the spiral, the perfect, dynamic form appears repeatedly, from the microcosmic to the macrocosmic world. The harmony of the universe in Swedenborgs synthesizing system can be interpreted as consisting of repetitions, the rhythmic repetitions of circle, of sphere and of spiral, where harmony is as decisive for unity as in a work of art. At the same time, Swedenborgs cosmology shares a few fundamental characteristics with the foregoing. It is the thought of a perfect order patterned by an Infinite Geometrician, the world as a reflection of perfect figures. Swedenborgs spiral is also a continuation of the doctrine of the perfect circle.

It is, indeed, a sort of perpetuated circle, and eternalized circular motion that describes all possible circles, in all dimensions. The universal significance of the spiral, from the motion dwelling in the point to the grandest structures of the universe can be derived from, among other concepts, the Cartesian concept of the ethers vortex. In spite of the fact that he was familiar with Newtons doctrine of gravitation, Swedenborg was and remained a Cartesian. He could never reconcile himself with the thought of empty space and action at a distance. The spiral motion of the ever-present point can be seen as a defense of the Cartesian thought of the *plenum.* Descartes vortical motion came to constitute the model for all physical motions in the microcosm as well as in the macrocosm. In the introduction to the third part of *Principia* this micro-macrocosmic spiral motion returns when a comparison is made between the magnetic sphere and the starry heaven, which carries our thought to a book that Swedenborg had in his possession, *De magnete* (1600) by William Gilbert, where our globe is likened to a great magnet. There are spiral motions or vortices in the magnetic sphere, Swedenborg assumes, and in the same way, there are also spiral motions or vortices in the sphere of the stars.. *Principia,* 376; Engl. transl., vol. II, 231.

In the macrocosmic vortex nearest us, the solar system, the sun is in the center, surrounded by particles in a vortical motion.. Ibid. 387; Engl. transl., 251. Cf. Tore Frängsmyr, *Geologi och skapelsetro: Föreställningar om jordens historia från Hiärne till Bergman* (Uppsala, 1969), 174. From the vortex is formed a rotating shell of material which on account of centrifugal force breaks free from the sun. The shell explodes and the fragments fly out to form a belt that encircles the sun in ever-greater circles, to be burst again. The broken-up mass of material gathers itself together into perfect, round globes or spheres. The spherical planetary bodies distance themselves from the sun in spirals in order thereby to reach their final, circular orbit. Even the earth itself forms a vortex, quite in harmony with the solar vortex.

Beyond our solar system, the countless stars form vortices resembling that of our own sun. Nevertheless, Swedenborg adds, the starry heaven we see is perhaps only one of a countless number of spheres or starry heavens in the finite universe.. *Principia,* 380; Engl. transl., vol. II, 238. Our starry heaven is perhaps only a point in comparison with the whole universe. All these starry heavens or galaxies may be a part of yet greater constellations, Swedenborg suspects. Within every solar system the laws of geometry and mechanics, nevertheless, are and will remain the same. The differences and variations consist only in different degrees, proportions and figures. But mechanics can actually be different in different worlds, since the outer circumstances differ. Archimedes genius and ability might be valueless in another world where proportions and figures differ from what we find on our globe, Swedenborg writes.. Ibid. 384; Engl. transl., 246. The Infinite can vary creation in infinitely many ways, and consequently he can also vary geometry and mechanics infinitely. The worlds perfection consists in just such variation: "*varietas est perfectio mundi.*". Ibid. 382; Engl. transl., 242. Consider the vegetable kingdom, how rich, pleasant and enjoyable it is, simply due to its variety, exclaims Swedenborg. The perfection of the world stands in proportion, certainly, to the greater alternations, changes and incidental characteristics that cooperated in its formation. The world is more perfect and beautiful in its complex than in its simple things, and in a greater and freer rather than a more limited motion. In nature, there is nothing that can move itself with greater freedom and facility than the motion of the spiral.

The membrane between body and soul

In Swedenborgs early philosophy of nature, which was inspired by Polhem, one finds a tremulation theory, that is to say, a theory that organic life and mental activity consist of kinds of vibrations. And these vibrations are found not only in the blood flow and nervous system, but broadly speaking, in the whole life of the soul. As editor for Swedens first scientific journal, *Daedalus Hyperboreus*, Swedenborg published an article, "A proof that our vital essence consists for the most part of small vibrations, that is of tremulations" (1718). There he assumes that human beings inner quiverings can affect each other at a distance: "It often happens that one comes into the thought of another, and has an idea of what the other is doing and thinking, that is, that his membrane vibrates from the others vibrations, as one string [on a musical instrument] by another.". E. Svedberg, "Bewis at wårt lefwande wesende består merendels i små darringar thet är tremulationer," in *Daedalus Hyperboreus* VI, 13. Thus, what he means to say is that there is a kind of thought-vibrations, that thoughts can fly through space in the form of tremulations, as do the wave-motions of light. In *De mechanismo* (1734) one again finds his mechanistic thoughts about tremulations in the body and soul. Here he even presents a research plan, which he would come to follow for ten years. Its task was to prove the immortality of the soul to the senses themselves.. E. Swedenborg, *Prodromus philosophiae ratiocinantis de infinito et causa finali creationis: deque mechanismo operationis animae et corporis* (Dresdæ & Lipsæ, 1734), 268; Engl. transl. *Outlines of a Philosophical Argument on the Infinite, and the Final Cause of Creation; and on the Intercourse between the Soul and the Body* (London, 1847), 148. The theological concept of an immortal soul would be proven, in other words, by empirical studies and a scientific investigation into the machine called "man."

Swedenborg thinks that the body is a machine. The soul too, like the body, consists of a kind of active and passive particles, but of a more subtle nature. Therefore, he attempts to find the mechanical souls seat in the human body on rational grounds. He rejects the thought that the soul can be found spread out through the whole body, and Descartes thesis that the soul and body meet in the pineal gland (*glandula pinealis*). Swedenborg does not believe that the soul is in one particular place; it is rather that the soul should be located in those membranes which are most highly developed and whose structure is most refined, as in the brain, particularly in the cerebral cortex and also in the medulla oblongata. One of the chief purposes of *De mechanismo* is to attempt to find out how the body can affect the soul and vice versa, how the corporeal particles of the body can exert a force on those of the soul in accordance with the laws of mechanics and geometry. He appears in other words to be taken up with the problem of the souls and bodys interaction, which arose from and with Descartes strict dualism between extended substance and thinking substance. To be able to keep the mechanistic theory, Swedenborg maintains that both the body and the soul actually must consist of extended substances. Consequently, there must also be a membrane in the body, especially in the most refined parts of the cerebral cortex, where the motive impulse of the corporeal particles can be transferred to the particles of the soul.. E. Swedenborg, "*Comparatio systematum Christiani Wolffi et Svedenborgii,*" in *Photolith.* III, 108*;* Engl. transl. *Psychologica: Being notes and observations on Christian Wolffs Psychologia empirica* (Philadelphia, Pa., 1923), 24. Cf. Inge Jonsson, *Swedenborgs korrespondenslära* (Stockholm, 1969), 73ff.

In the manuscript called *Comparatio systematum Christiani Wolfii et Svedenborgii* (1733) Swedenborg has

made a sketch of such a membrane. The manuscript is a critically annotated excerpt from Christian Wolffs *Psychologia empirica* (1732), which points to his ambition to compare his own work with the very latest developments in the philosophy of nature. The sketch pictures a membrane between the body and soul that would be in agreement with his particle theory in Principia. It actually consisted of five different levels of membranes, where each level contained different elements and had different functions: memory, vision, hearing and the remaining senses. These levels of membranes communicate the motions between soul and body in both directions. Consequently, an outer, mechanical sensory motion passes through them in order to arrive finally at a structure that spirals like a snail shellthe soul. This soul-spiral or "spiralis cum conis" is developed according to harmonic proportions and consists of a hyperbolic curve. Since the spiral is a continual curve that contains, so to speak, all radii, it can also be affected by every kind of tremulation or vibration of the different particles. At the same time, Swedenborg imagines that the spiral construction has the same possibilities for individual variation as there are in different musical instruments. There are no two instruments that sound exactly the same, in spite of the fact that they are in harmony with each other, and the same is true for two different soul-spirals. He confidently points out that future research will verify this theory about a soul membrane: if only one had a sufficiently strong microscope, one would be able to see the whole structure of the soul.

Swedenborgs sketch of a membrane that couples the soul with the body is an attempt to combine his concept of tremulations with Wolffs metaphysics, thus, to unite physiological and physical principles with purely abstract, philosophical ones. The difficulties he encountered with this led to his going more deeply into metaphysics and ontology in the ensuing years, not least during his travels for study, 17361740. The empirical manifesto in *De mechanismo*, where the immortality of the soul was to be proved using empirical methods, now took another direction. The mysteries of the body and soul were to be attacked from the view of metaphysics, geometry, mechanics, and through figures and calculations. An attempt in this direction was *De cerebro,* a manuscript presumably finished in Venice August 9, 1738, before his departure to Padua.. E. Swedenborg, *Resebeskrifningar af Emanuel Swedenborg under åren 17101739* (Stockholm, 1911), 85. See also James Hyde, *A Bibliography of the Works of Emanuel Swedenborg* (London, 1906), 70. The work treats of the brain and its functions. The investigation of the circulation of the blood led him to the brains meandering windings. He found that not only the large brain and blood vessels but also the small brain, the heart and the muscle fibers can display serpentine and helical twistings. The whole universe actually moves in this way, in its greatest parts as in its leasts. The whole discussion plays out into what are perhaps Swedenborgs unstinted words of praise to the spiralin the absence of all resistance, this form moves forward of itself, it is eternal, spontaneous, the most perfect geometric and noblest of all forces.. E. Swedenborg, "*Transactionum de cerebro fragmenta,"* in *Photolith.* IV, 134; Engl. transl. *Three Transactions on the Cerebrum* (Philadelphia, Pa., 1938), vol. I, n. 409. It is the *figure of figures.* For the most perfect things, it is the *only* possible motion. Nature itself dresses in this motion, since the spiral form offers no resistanceit consists of an infinite number of angles and surfaces, or, as it may also be defined, of a single angle and single surface. In an eternal and completely perfect spiral, there is a center at both the circumference and the radius at the same time that there is a radius and circumference at the center. From this figure is produced everything geometrical and mechanical in the world.

This infinite *Archimedean screw* comprises and can overcome all forces in the composite world. These words of praise are followed by a few experiments with twisted ropes, with the help of which Swedenborg endeavors to illustrate his thought about the spiral. Like *Minerva Lanifica,* the Divine weavershe who weaves the world with her yarn (and is besides the Roman protectress of physicians)the brain weaves and interlaces its fine threads. These spiral- and helically-shaped circuits in the brains tapestry implyand Swedenborg emphasizes that this is a geometric truththat they display poles, equators, ecliptics and meridians in the same way as do the heavenly bodies in the universe. Unfortunately, we cannot observe this with the help of a microscope. But we can still draw the conclusion that there is an underlying reality that is more perfect, a reality beyond the limits of vision. Our conclusions must instead be based on reason and geometry. He concludes the chapter on the brains surface, poles and centers with the contention that he does not believe that reason is hallucinating in its conclusions regarding the geometry of its invisible organs.. Ibid. 259f; Engl. transl., n. 746.

From the angular to the perpetuo-spiritual form

Swedenborgs search for proof of the immortality of the soul and his hunt for the seat of the soul, resulted in a long series of anatomical-physiological works. First came *Oeconomia regni animalis* (17401741), whose first two volumes lay finished from the printer upon his arrival home from his travels to continental destinations. In this work he investigates the human bodys most subtle functions, but he does not proceed from his own experiments or microscopic studies but utilizes a more synthetic approach. He attempts to draw conclusions based on excerpts from the investigations of a few well-known microscopists and physiologists, such as Malpighi, Leeuwenhoek, Swammerdam, Boerhaave and others. One can say that *Oeconomia* is an attempt to integrate physics and anatomy with metaphysics, incorporating at the same time Neoplatonic tendencies and clear elements of geometric reasoning.

Even in this work, which treats primarily of the human bodys physiology, of the blood and the bodily fluids, one again finds the spiral. Among other things, Swedenborg observed that the spiral motion is a customary occurrence in nature. The most suitable form for the forces in nature is the spherical form, since it does not have any angles or protruding parts. It rests in turn on a first principlethe perpetuo-spherical or cubo-spiral form. When something goes from its previous to its future world, that is to say, when something changes, Nature displays no higher rank of curve than this.. E. Swedenborg, *Oeconomia regni animalis in transactiones divisa* (*Londini & Amstelodami*, 17401741); Engl. transl. *The Economy of the Animal Kingdom, Considered Anatomically, Physically, and Philosophically* (New York, 1903), vol. I, n. 101. We find a spiral in, among other places, a chapter on the egg, a chapter that even provides a sample of Swedenborgs break with Descartes mechanistic picture of the world. Here Swedenborg takes a more teleological view of formative forces. The fibers and the heart muscles consist of perfect spirals or helical curves, whose forms are significant for the hearts expansion and contraction. Swedenborg emphasizes that everything strives toward perfection, and therefore even the very simplest substances have a spiral or helical form.. Ibid. n. 302. The whirling of the smallest substances perfectly corresponds at the same time with the whirling of the sun.

In the chapter on the soul in part two, there is a passage that describes nature as a great circle.. Ibid. vol. II, n. 287. This universal circle embraces an unbroken series of smaller circles, which all refer to a common center. All the points in these circles, regardless of their location in the great circle, point toward a common center. If any point in its revolution around its circle in the great circle does not refer to the common center, it is cast out of the great circle as being false. It is the same with the activities and emotions of the soul and of the body. Even they rise or fall in relation to the center of realityGod. One senses a Neoplatonic line of thought here. In Swedenborgs philosophical notes from 1741, one finds an excerpt from Plotinuss *Enneads.*. E. Swedenborg, *A Philosophers Note Book,* Engl. transl. (Philadelphia, Pa., 1931), 241. Cf. "Ennead IV", i *Plotinus*, ed. Loeb, 443 (Cambridge, Ma. & London, 1984), 10f. Cf. Lars Bergquist, *Biblioteket i lusthuset: Tio uppsatser om Swedenborg* (Stockholm, 1996), 87. There the Divine being is described as a center in a circle, toward which all the radii are directed. Everything is tied to this center, everything longs

for it and nothing can exist without it. From it emanates the Divine, omnipresent light, as light from the sun. In a similar way as in that tradition from Hermes Trismegistos, God could be likened to a circle whose center is everywhere and whose circumference is nowhere.

The concept of nature as a circle with radii directed toward a universal center leads to a common theme in the history of ideas: the opposition between the curve and the straight line, between the circle and the square, and between the sphere and the cube. The former represent what is spiritual, Divine and heavenly. The latter stand for what is material, human, and earthly. Aristotelian physics made a difference between the circular motion of the heavens and the sublunary straight line. In a related way, Plotinus made a distinction between spiritual circular motion and physical linear motion. Cusanus thought that geometric figures primarily have symbolic meaning, when they extend to the infinite, where the curved and the straight line become coincident. In his thinking, there is a continuous path from the finite figure to the infinite. Kepler in turn thought that in the beginning God made the distinction between the curve and a straight linewhere the former is equated with the deity himself, while the straight line refers to his creation.. Johannes Kepler, "Mysterium Cosmographicum," i *Gesammelte Werke,* vol. VIII (1621; Munchen, 1963), 45. In Swedenborg we find a similar hierarchy of forms, from finite, material forms to more and more infinite and spiritual ones. Swedenborg puts forth this thought in his posthumously published work *De fibra* written in 1740, which was envisioned as constituting the third part of *Oeconomia*.. E. Swedenborg, *Oeconomia regni animalis in transactiones divisa*, III (Londini, 1847); Engl. transl. *The Economy of the Animal Kingdom, Considered Anatomically, Physically, and Philosophically*, vol. III (1918; Bryn Athyn, Pa., 1976), n. 260273. Cf. Jonsson, *Swedenborgs korrespondenslära*, 125ff. Here the Cartesian vortices from his cosmology return, but now the spiral and the vortex are brought together in a psycho-physical speculation about the hierarchy of forms. In this theory, the doctrine of forms, he makes use of a concept of form that properly speaking is not Aristotelian, but lies closer to a Wolffian representation of the universe.. Cf. Inge Jonsson, *Emanuel Swedenborg* (New York, 1971), 75f. Swedenborgs "form" progresses gradually from the concrete form of the natural object in physics, through the vital forms in biology, and the forms of thought and ideas, to spiritual, Divine form.

All of this began with Swedenborgs attempt to determine the form of motion in the fibers of the human body. He refers to Leeuwenhoek, who assumed that the blood vessels and nerve fibers had a circular or spiral form like that of a snail. Since these fibers could not be seen in a microscope, Swedenborg proceeded instead from concepts derived from a hierarchy of forms. This stairway of forms, from the lowest to the highest, had seven steps. Each higher step in the series involved the lower form being "perpetuated," becoming infinite in more respects, received a higher degree of eternity, infinity, and spontaneity. At the same time, in every form there was a *"repraesentatio,"* a mirroring of the subsequent forms, where the higher form is a model for the lower. The perfection of these forms consists in their possibility of and ability to be modified and change state. The higher up one goes in the hierarchy, the higher the degree of infinity and perfection the forms have, and consequently the greater ability for change and variation.

The lowest form is the *angle,* since it is bound by two straight lines that lack a common center. Examples of angular forms are tetrahedrons, octagons and the polygonal forms of salt. These give rise to taste and smell and constitute the subjects of research in geometry, physics and chemistry. Higher in rank is the *circular* or spherical form, which is the form of material motion. This form, which is also called the perpetuo- angular, has assumed a characteristic of the lower forms in that the radii of the circle consist of straight lines from the circumference to the center. The circle always has the same angle and surface. The sphere is more complete than the angle: its surface resembles an infinite angle and all the radii can be referred to one point, its center.

The third form in the hierarchy is the *spiral*, or perpetuo-circular form. The circle, in other words, has been allotted a higher degree of infinity. The circle can be varied in all kinds of ellipses, cycloids and curves. But the spiral can be varied in a still higher degree, since it not only has a fixed center that also varies, its center is constituted of spherical surfaces and all possible curves can be its center. The spiral is therefore more perfect than the sphere and the circle, since it has been allotted a degree of eternity and infinity. The spiral form applies to the active forces of nature. The methods of geometry almost reach this level. There the spiral challenges its abilities. The next step is the *vortical* or the perpetuo-spiral form. To this form has been added yet another degree of infinity. The whirls circle spirally and describe all possible circles from the center to the circumference. This is the form of the vortical motion and corresponds to the vortex around the earth. After this comes the fifth formthe *celestial*, the heavenly or perpetuo-vortical form. This is the highest form in nature and according to Swedenborg corresponds to "The One" in Platos *Timaeus* or to "The First" in *Parmenides*but it also corresponds to Leibniz's monad and Wolffs "simple substance.". *Oeconomia,* vol. III, n. 266. The celestial form in its turn is infinite in a higher degree and is also impossible to describe with words or geometry. This form lacks actual shape, extension, size and weight. Nothing is above or below something else. Likewise, nothing can be referred to a center, radius or surface. Going further, we have the *spiritual* or perpetuo-celestial form. Neither can this be described with wordsit is inaccessible to human reason. It can only be described with abstract speech, such as the angels language. It is the form used for the communication between mans soul and the Divine. But there is finally yet another form, the *Divine* or perpetuo-spiritual form, a form that is far away from all natural attributes. It is not an actual form but Divine Being, the Creator of the universe, Beginning and End.

This Jacobs-ladder of forms from the lowest earthly form to the Divine, expresses Swedenborgs effort to find a universal order. At the same time there is a variation in the thought of natures series and degrees. All of reality constitutes an unbroken chain of forms which all lead to the Divine. From the highest form proceeds a descending stream reminiscent of the emanations of Neoplatonism. From the Divine proceeds what is spiritual, what is spiritual creates what is heavenly, from what is heavenly, whirling forms arise, and so on down to the lowest angular form.. Ibid. n. 268, 272. The geometrical-mechanical construction of the world presented in *Principia* has passed over into an organic teleological system colored by Neoplatonism. Nature is a chain of forms which all lead to their final end, the Divine form.

The universal mathematics and the form of ideas

In 1743, Swedenborg presented a new plan of research to the Royal Academy of Science. Its intended product was to be a work consisting of seventeen parts, treating of the whole of mans anatomy, physiology and psychology. Only three volumes of this *Regnum animale* (17441745) were published in his lifetime. In the first volume of the chapter on the stomach, which contains a recapitulation of his doctrine of forms he writes that a perpetuo-circular or spiral form of motion is to be found in the stomach, intestines and brain and throughout the whole body.. E. Swedenborg, *Regnum animale anatomice, physice et philosophice perlustratum* (Hagæ Comitum & Londini, 17441745); Engl. transl. *The Animal Kingdom, Considered Anatomically, Physically, and Philosophically* (London, 18431844), vol. I, n. 97. It is the essential form of motion of the organic substances. The spiral can be observed from its winding and tracksin the muscle fibers, the nerve fibers and the arteries and veins, the ligaments, the glands and in many other parts, like the cochlea of the ear, whose form corresponds to the spiral motions of the air. The spiral motions are synchronized exactly with the respiration of the lungs, where the spirals go through a rotation in the course of every breath. All the parts in the organic body follow the law that the larger, composite visible forms

exist and are dependent upon smaller, simpler and more perfect ones; they are utterly dependent on the smallest, invisible forms that are so perfect and universal that they contain an idea that represents the whole universe.

A draft of the work on the five senses, *De sensibus* (1744), intended as the fourth part of *Regnum animale,* gives an account of, among other things, the spiral form of the cochlea and of the motions of the eye, which describe not only a circle but also a spiral.. E. Swedenborg, *Regnum animale anatomice, physice et philosophice perlustratum* IV (Tubingæ & Londini, 1848), 7682, 105f; Engl. transl. *The Five Senses* (Bryn Athyn, Pa., 1976), n. 230261, 395. Throughout nature, its motions approach being continuous, striving toward the eternal form that the spiral represents. The seventh, posthumously published part in the same series, *De anima* (1742), which among other things is an investigation of the pure intellect, ends up in an attempt to create a kind of universal mathematics with the aid of which one should be able to calculate all scientific statements.. E. Swedenborg, *Regnum animale anatomice, physice et philosophice perlustratum* VII (Tubingæ & Londini, 1849), 255ff; Engl. transl. *Rational Psychology* (Philadelphia, PA, 1950). Cf. Jonsson, *Swedenborgs korrespondenslära,* 129f. This "mathesis universalis" envisioned by Swedenborg corresponds to the rationalistic dream that permeates Leibnizs "*characteristica universalis*" and Wolffs "*ars characteristica combinatoria*." The pure intellect, which in Swedenborgs hierarchy of forms corresponds to natures highest form, the celestial, contains the bodys innermost nature, the fundamental principles of all knowing and of all sciences. If we are acquainted with these scientific fundamental principles, using universal mathematics we could work out all simple ideas. Thus, here in Swedenborg we find a purely rationalistic line of thought. The human being has inborn ability to know all things. It is only a matter of identifying these ideas in the pure intellect. We know that ideas are a kind of change of state in the cells of the brain. If one can geometrically describe these changes as circular and spiral forms, it should also be possible to use a calculus to reckon with these ideas. Thereby we would arrive at a universal mathematics.

Swedenborgs euphoria

"This past night, I slept very tranquilly until three or four in the morning, when I woke and lay awake, but as in a vision. I could open my eyes and be awake when I wished, so I was not otherwise than awake, but in my spirit there was an inward joy that could be felt all over my body. Everything seemed in a consummate way to be fulfilled, flew upward as it were, concealing itself in something infinite, as a center, where love itself was, and it seemed as if it issued thence round about and then down again, thus moving around in incomprehensible circles from a center that is love, and back.". E. Swedenborg, *Swedenborgs drömmar 1744 jemte andra hans anteckningar* (Stockholm, 1859), 19.

Early in the morning, April 10, 1744, Swedenborg awakened. He was gripped by a dizzying euphoria, an endlessly widening, circling motion, from the center of love itself and then back again, as incomprehensible circling motions from the center to periphery and back to the center. This infinite circling motion that expands from the center and returns in toward the center reminds one of the mathematical points rationally incomprehensible, infinite, spiral motion. Here the mathematical points effort to motion becomes an inner state of transcendent spiral motion. In the sentence directly following this Swedenborg makes a comparison to this euphoric circular motion: "this love, which then filled me, in a mortal body is like that delight a chaste man enjoys when he is truly in love and makes love to his spouse.". Ibid. 19f. The spiral-like motion in Swedenborgs euphoria described here displays a characteristic of the *Dream Book* (17431744), namely, the dreams often have erotic undertones. For the whole of the previous day Swedenborg had been sunk in prayer, sung hymns to the Lord, read the Bible and fasted. Thus, we find ourselves in the midst of one of the most eventful periods of Swedenborgs dream-crisis.

His journal for this month is full of notes on dreamshow he wrestled with his new and growing path of life. He begins to see his spiritual assignment more and more clearlythat he must leave his scientific path in order to devote himself totally to what is spiritual. In July 1743, he left Sweden for the Hague, in order to print the first two volumes of *Regnum animale*. At the time of his "spiral-euphoria" he was working on editing the epilog to the second part, and in September 1744 he continued with the third part.. Lars Bergquist, *Swedenborgs drömbok: Glädjen och det stora kvalet* (Stockholm, 1988), 13, 15. But he soon pushes this huge project to the side and in 1745 has a work printed whose spirit is religious, *De cultu et amore Dei.* His doctrine concerning spirits was still in embryonic form.

Spiral dances in paradise

De cultu is a poetic paraphrase of the Biblical creation story, from the origin of the solar system from the cosmic egg to the marriage of the first-born. In several respects this works follows the *Principias* cosmogony and the *Oeconomias* physiological theories, even if its description of paradise is a new element.

Therefore it does not come as a surprise that one finds the spiral once again in this work too. The cosmogonic element concerns, among other things, the birth of the planets from the sun, how they were slung out into their orbits. These bodies, seven in number, take their motion from the sun as "tendrils from a vine," in a trajectory spiraling out from the hot middle point.. E. Swedenborg, *De cultu et amore Dei* (Londini, 1745); Engl. transl. *The Worship and Love of God* (Boston, 1914), n. 11. Even the earths molten mass was slung out in snail-like whorls. While the earth was distancing itself from the sun in ever-widening spirals, the year, that is, the time of its rotation around the sun, became longer. Even the days became longer, since the earths rotation around its axis slowed.

During this spiraling movement away from the sun a paradise arose, which is described as a lovely garden, a wonderful grove that "breathed only beauty and richness," through which the rivers wound their way and "sported in their playful circuits.". Ibid. n. 21. And when the animals in the waters were created, first there were shellfish and snails. These snails carried their houses on their backs, which shone with the bright color of gems, "winding in perpetual circles or spires after the manner of the revolving heaven.". Ibid. n. 28. This echoes Swedenborgs micro-macrocosmic view of the world, where the spiral is a recurring theme. Thus, here it is the snails shell that mirrors the vortex of the planetary system. The houses the snails bear on their backs lead the thoughts undeniably to the spiral form of the Nautilus and other spiral-shaped snails, which can be described as logarithmic spirals. In this context an interesting connection can be made to a book that was in Swedenborgs library and also much used. It is the microscopist Jan Swammerdams *Bybel der Natuure* (1737), for one section shows that all spiral-shaped snails can be related to the same form, the tubular form.. Jan Swammerdam, *Bybel der Natuure* (Leyden, 1737), vol. I, 151. Cf. Swedenborgs manuscript "Johannis Swammerdamii Biblia Naturæ" (1743), in *Photolith.* VI, 184264.

On the Sixth Day, the last day of creation and first of mankind, it was celebrated with a special kind of dance or circle-game, called the "game of paradise.". *De cultu,* n. 42. This circle dance consisted of spheres and spiral windings, where the heavenly bodies swing in a ring and bend themselves from the circumference to the center, in a circular form and continuous curve, until they are united in the center. From the center the game continues in new revolutions to a more world-encompassing circle and perfection. to be united again in new centers. After three repetitions, the game had reached a degree of infinity and was near to ascending into the idea of supra-heavenly harmony, where all bodies were understood as one. Even the newborn Adam was allowed to take part in the circle dance and was borne round in the outermost

circuit. The dancers turned outward again, in concentric circles toward the circumference. This game taught Adam that his body should obey his soul. The paradise dance became a correspondence to the spiral or perpetuo-circular motion of the mathematical point and the vortical motion of the planetary system. A similar dance occurs in a later passage, when Adam finds himself surrounded by naked infant girls who begin a winding circle-dance.. Ibid. n. 57. They move toward the center in convolutions and spirals, and upward to the heights, ever forward. The girls gleamed like little stars, Swedenborg writes, which cast their rays from the center to the periphery and thereby formed a shining glow circulating around the spiral ring. These beings represented kinds of goodness, which means that the dance was "the game of love and goodness." The dance corresponded to the truths which are born through a series of progressive acts of goodness. The forms harmony was a correspondence to the feelings of happiness and goodness. The circular ring dance consequently displayed an agreement between truths and the highest good.

This figurative spiral dance in *De cultu* carries the thought to a particular ballet in the Renaissance, "*danses figurées*," where the attempt was made to picture the order and beauty in the dance of the cosmos.. S. K. Heninger Jr., *Touches of Sweet Harmony: Pythagorean cosmology and renaissance poetics* (San Marino, Ca., 1974), 178. The dancers form into different geometrical figures like circles, squares and triangles, which remind one of Swedenborgs geometrical dance patterns forming infinite circles and spirals. We find similar thoughts about the whirling dances again in William Hogarths *The Analysis of Beauty* (1753). The minuet, popular in the 1700s, displays in its serpentine lines the greatest possible variations of motion as it moves in rhythm with the tempo of the music. In the same way, the "S" shaped movements of the folk dance are filled with beauty and mystery. Hogarth contrasts these noble serpentine dances with the barbarians wildly leaping, convulsive jerks and perverse exhibitions.. William Hogarth, *The Analysis of Beauty* (1753; Oxford, 1955), 160. We further find a meandering cosmic dance in John Miltons *Paradise Lost* (1667). The angels carry out an intertwined, labyrinthine dance with movements in harmony with the Divine, a dance not wholly unlike the spiral dance of the heavenly bodies and the heavenly beings in Swedenborg and the serpentine revolutions of the minuet.. John Milton, *Paradise Lost,* ill. William Blake (1667; Liverpool, 1906), 159f. Cf. Hogarth, 160. Miltons *Paradise Lost*, according to Martin Lamm, was a model for *De cultu et amore Dei*. Martin Lamm, *Swedenborg: En studie över hans utveckling till mystiker och andeskådare* (1915; Johanneshov, 1987), 166. Inge Jonsson has more recently shown that the similarity between *Paradise Lost* and *De cultu* depends more on common classical sources, not least Ovid, than on a direct influence by Milton. Inge Jonsson, *Swedenborgs skapelsedrama De cultu et amore dei: En studie av motiv och intellektuell miljö* (Stockholm, 1961), 168.

Dance in *De cultu* becomes a language of correspondences. Here the spiral, or the spiral dance, becomes an expression of the progressive benevolence that gives rise to the truth. The visual picture of the spiral leads to a philosophical description of the relationship between goodness and truth. One of the clear features in Swedenborgs work is just this close relationship among truth, goodness and beautysomething one finds in many places in the history of philosophy, as for example in Plotinus and Shaftesbury. The concepts develop from a common ground: Godhe who is Wisdom and Goodness itself creates only what is fully true, good and beautiful. Something that is true is consequently also something good, even if they are considered as separate. In Swedenborgs case, the pictorial language of geometry expresses the relationship between the true and the good. Goodness is the center from which truths spread themselves to the circumference. All truths refer to what is good as their first and last object. The thought of a relationship between truth and goodness becomes still clearer in Swedenborgs theological work *De nova Hierosolyma et ejus doctrina caelesti* (1758): "It is a law of Divine order that good and truth should be joined together and not kept separate, so that they make one single unit, not two.". E. Swedenborg, *De nova Hierosolyma et ejus doctrina cælesti* (Londini, 1758); Engl. transl. *The New Jerusalem and Heavens Teaching for It*, (London, 1990), n. 13. Swedenborg calls the conjunction of what is good and what is true the "heavenly marriage."

The cosmogony of the *Principia* was a model for the very first days of creation. When the creation story then turns to Adam and Eve and the innermost anatomy of their bodies, one can unite these descriptions with *De fibra* and the hierarchy of forms. Standing before Eve, an angel carries out a dissection on himself to demonstrate the order of forms.. *De cultu*, n. 95. There is a conversation, which at the same time reflects Eves own thinking. The angel opens a nerve and lays open a fiber rolled in spiral windings. Its membrane is then drawn away and a little "brain" appears, with small spheres arranged in a sub-celestial form. The form corresponds to sensory consciousness, "*animus*," which is the connecting link between heaven and the natural world. Its circles and poles are in full agreement with the motion of the earth. Eve then opens one of these small spheres, and within she sees countless new small whirls bending in the heavenly form in infinite curves and circles, the form of the reasons intellect. When one of these whorls opens, the highest of all forms appears, the supra-celestial, the innermost heaven or the souls inner sanctum.

Thus one has finally come to the supra-celestial form, which is not an actual form but something that simply *is*: "in the supra-celestial there is nothing but what is Perpetual, Infinite, Eternal, Incomprehensible: the Order, the Idea of the universe, the Essence of all essences.". Ibid. n.93. Eves and the angels opening of forms that enclose new forms brings to mind here Chinese boxes. When each form is opened, a new form is found, which is more perfect, infinite and varied. The whole series of forms, from the angular to the supra-celestial, contain each other, and one goes in ever further, to the innermost core of creationGod.

The order also is such that the supra-celestial streams down into the celestial and further down to nature, to its outermost boundary, in order to return to the supra-celestial. This descent and ascent in Swedenborgs thinking shows similarities with Neoplatonisms *emanation* doctrine, which describes an outflow or radiation from the One, from the highest principle to the lowest earthly things. There is in this order, Swedenborg thinks, a correspondence between beauty and the form of the fiber, according to the laws of natures harmony, which manifests itself in beautiful and bending curves. The curve becomes an expression of natures harmony and beauty. He describes this as the Divine in its descent, clothing itself in the forms of nature as a point clothes itself in circular spirals all the way down to natures outermost boundaries: in this spiral "all things remain most fittingly inscribed.". Ibid. n. 103. The whole of reality becomes a single, universal spiral, a circling, descending and ascending motion from the supra-celestial form, God or the Infinite. All meaning radiates from a center and can be led back to it. The universal spiral appears as the teleological *imago mundi,* where God becomes the ultimate cause of causes, the basis and prerequisite of geometry. Without him "not even a point or a line can be made, except from and by him.". Ibid. n. 113.

The geometry of the spirit world

In *Arcana coelestia* (17491756) and his spiritual diary, called *Diarium spirituale* or *Experientiae spirituales* (17471765), Swedenborgs theological system has more or less fully developed. However, the spirit world he has now begun to investigate lacks space and time, and therefore neither does it have geometry as here on earth. Geometry is actually something purely earthly, something that joins mankind with what is material. So it is, that time and space exist only in this earthly life and these concepts are precisely what limit peoples ideas and make them natural.. E. Swedenborg, *Diarium spirituale* (Tubingæ & Londini, 18431847); Engl. transl. *The Spiritual Diary* (London, 18831902), n. 4609m. However, the more one looks to heaven, to God, the more one distances oneself from time and space. But the opposite also applies. The more one distances

oneself from thought about heaven, the more one ties ones thoughts to time and space, and consequently the more one distances oneself from the idea of infinity and eternity.

In his study of Swedenborg, Martin Lamm shows that Swedenborgs theological system can be seen in the light of his philosophy of nature, that there is a connection between them. He also wants to lay aside the thought that his "dream-crisis" was a watershed between the two periods.. Lamm, xix, 95. However, there are a few considerations that stand in the way of such an interpretation. There is the matter of Swedenborg the theologians view of geometry, mechanics, and reason. If one finds that geometry is highly regarded in his earlier work on natural science, geometry is given a significantly less favorable place in his doctrine concerning spirits. Here geometry is an obstacle to understanding universal concepts, since it accepts only what is geometrical and mechanical. Consequently, neither can geometry reach beyond what belongs to the world and the body. This was precisely the case with Polhem, who could accept nothing other than what was geometrical and mechanical, and was even punished for this in the spirit world. His punishment was to build mechanical toys, and birds and cats; and when he then found a way to communicate with evil spirits, he was cast down into the deepest regions of hell and deprived of his inventiveness.. *Diarium spirituale,* n. 4722, 6071.

Geometry has its limitations. Even the lowest human forms, such as the intestines, surpass the forms that can be described by geometrical ideas. The spiral form of the intestines is surpassed in its turn by the forms involved in its activity. Swedenborg further maintains, in *Diarium spirituale,* that the subtlest forms of this activity cannot be imagined using geometry or infinitesimal calculus, since they boundlessly go beyond such calculations. But how, Swedenborg asks himself, should geometry be able to describe the forms that receive life, forms that immeasurably go beyond what is organic and can never be envisioned? Such is the relationship between human understanding and what is spiritual, heavenly and Divine: since the understanding cannot even show how waste is excreted by the intestines, Swedenborg draws the conclusion that human understanding reasons from the very dregs of these excretions, the most vile and sordid of all things.. Ibid. n. 3482 (October 5, 1748). This is not a pretty picture of human understanding that Swedenborg presents here. And the picture is one totally different from his mechanistic periods conception, in which human understanding was envisioned as having undreamt of vast potential. He now asserts that geometricians advocate, above all, the belief that nature is Godthe belief that nothing can be explained outside of their science. Yet not even with the widest range of their methods can geometricians determine the coarsest process of fecal secretion or the form of the intestines.

In spite of this, thoughts associated with geometry, together with an underlying fascination with its abstract beauty still live on in Swedenborgs spiritual doctrine. It becomes a kind of transcendent, supra-sensory geometry, high above the reality presented by the senses and reason. On one occasion God shows him forms that go beyond all that geometricians can imagine.. Ibid. n. 3483. There is a passage that makes associations with the hierarchy of the geometry of the doctrine of forms. The geometricians knowledge closes in a circle or in curves that are earthly and do not embrace even the lowest forms of air and water. The lowest or earthly forms, which are delimited by time and space, are arrived at by subtracting imperfections, such as gravity, rest, cold, etc. But there are forms that come out of these forms that are freer, and in turn others that are freer still. One then comes to forms in which nothing can be imagined except a center in every point. These forms consist only of centers that refer to all circles and circumferences, where every point represents centers and these have similar centers. After these, Swedenborg finds forms that almost totally lack boundaries and relation to time and space. But all these forms are still finite, since one can imagine an idea of them by abstracting what is finite from actual things. They are, in other words, within the sphere of nature and devoid of spiritual life. Consequently, as long as human reason dwells on such natural forms, it is going to be mistaken about lifes actual forms. This statement seems to mirror his own path in life. In his earlier years, in his search for the soul he had persistently concerned himself with the forms of nature, but during his dream-crisis he realized how hopeless this project was and became inspired instead to look into the higher forms of the spiritual world. All things both below and above lifes forms are nevertheless originally from God.

For Swedenborg there are forms in nature that human reason can never understand: "No one by any kind of abstraction can conceive of the forms that are within the natural, as I now perceive while writing concerning forms on the paper, being forced thus to confess that there are spiritual forms within the most subtle forms of nature which are never perceptible.". Ibid. n. 3484. The forms in the higher realms, in the spirit world, are still more inconceivable to man, as it is put in a journal note dated October 7, 1748.. Ibid. n. 3495. Swedenborg saw how some other spirits formed a kind of circular spiral and how Gods life flowed in something like an infinite, perpetuo-spiral form. But no one can know the nature of this spiral form except God.

The spiral traitor in Gehenna.

According to notes in *Diarium spirituale*, Swedenborg was one day given to see Indian spirits circulating in a vortical motion, and the next day he also saw Mohammedan spirits circling around him.. Ibid. n. 402, 407 (December 2627, 1747). It was Mohammed himself who had sent these spirits. They circled around Swedenborg in a vortical motion resembling the washing of the feet from the soles upward. This spirally moving washing is pleasurable, toofor those, Swedenborg adds, who like such things. He took the occasion also to talk a little with Mohammed. The oriental spirits involved in this spiral motion seem to have been quite good-natured, with the exception of a leprous devil with a turban, wound like a snake around his head, who was so proud as to claim that he was God himself.. E. Swedenborg, *Delitæ sapientiæ de amore conjugiali; post quæ sequuntur voluptates insaniæ de amore scortatorio* (Amstelodami, 1768); Engl. transl. *Delights of Wisdom Relating to Married Love followed by Pleasures of Insanity Relating to Licentious Love* (Bryn Athyn, 1994), n. 264. However, not infrequently the spirally wound form of a spirit is an expression of something traitorous, treacherous, seductive and dangerous. Among other things, on two occasions Swedenborg saw insidious female traitors, and on another a murderer who transformed himself into spirals.. *Diarium spirituale,* n. 32213222 (September 21, 1748), 3968 (November 13, 1748), 4098 (November 29, 1748), 4424, 4581m, 4686 (undated). An exception to treacherous transformation into a spiral is mentioned in *De amore conjugiali,* n. 461.

Perhaps the most remarkable account involving spirits in a spiral form has to do with Swedenborgs thought that the whole universe pictures a single macrocosmic human being, a *Maximus Homo* (the Grand Man). The thinking that man is a microcosm, a miniature of the macrocosm, where his body and its parts are a symbol for unity, is something we find repeated in several places in the history of ideas, including Platos *The Republic* and in a related way Aristotles *Politics* and the letters of Paul. In Swedenborgs world-view, the *Maximus Homo* is related to the doctrine of correspondence. The reason the parts of a human being correspond to the heavens is that God the Messiah, as Human, fills the universe. Therefore Heaven is God the Messiah Himself, and thus the heavenly spheres and vortices correspond to him.. *Diarium spirituale*, n. 279 (November 29, 1747). Every part of the body in the microcosmic human being corresponds with a similar bodily part in the Grand Man, and to a specific spiritual characteristic also. In his travels in the spirit world Swedenborg visited different regions of the Grand Man, which meant consequently that he even came to travel to the most intimate regions around the pelvis. He describes these areas in detail in, among other

places, *Arcana coelestia*.. E. Swedenborg, *Arcana cælestia quæ in Scriptura Sacra seu Verbo Domini sunt detecta* (Londini 17491756); Engl. transl. *Arcana coelestia*, n. 50505060. Swedenborg also speaks of certain spiraling spirits from the urine in *Diarium spirituale*, n. 1233 (March 8, 1748). They correspond, as perhaps one might expect, with marriage love and societies whose angels are involved in just this love. Those who dwell in these communities are the most heavenly, and enjoy greater serenity and pleasure than the inhabitants of other communities who correspond to other parts of the body. The testicles correspond to spirits who are opposed to marriage love. This is what gives rise to pain in mens testicles. In them dwell spirits whose love and friendship is traitorous. Just a few of these spirits approached Swedenborg on one occasion. They wanted to speak with him in secret. They had something to hide.

From the region of Gehenna, something airy and scarcely visible drifted up. It was some of those secretive spirits, who, although there were many of them, at first looked to Swedenborg like a single spirit.. *Arcana cælestia*, n. 5060. The episode is drawn from *Diarium Spirituale*, n. 40824084 (November 27, 1748). A small, snow-white spirit immediately came forth from the group. He came forward to Swedenborg. This behavior, an angel explained, pictured these spirits scheme to put on appearance of innocence, so that no one would suspect what they actually were like. The spirit then wound himself around Swedenborgs hips, and this pictured their desire to present themselves as spirits filled with marriage love. Then the spirit wound himself in spirals around Swedenborgs feet, which in turn pictured their desire to wind their way into something that is enjoyable in natural life. At the end, the little spirit became almost invisible, which stood for his desire to withdraw himself totally from Swedenborgs view. The angels then told Swedenborg what all of this meant. Such winding is characteristic of those who act traitorously in regard to marriage love, that is to say, who commit adultery.

When this was brought to light, the little snow-white spirit became visible again, but he was now black and deformed instead. That same hour he was cast deep down into the hell that is in the middle between the hips. The inhabitants there live in wicked excrements and among robbersthus among spirits who have an uncontrollable sensual desire. The spiral windings of this traitorous spirit have several remarkable similarities with a scene in Goethes *Faust* (1808). Faust, in company with Wagner, sees a black poodle and exclaims, "Do you see how he spirals round us, snail-shell-wise, and ever closer on our trail?". Johann Wolfgang von Goethe, *Faust: Eine Tragödie* (1808; Leipzig, 1968), 75f; Engl. transl. *Faust* (Indianapolis, 1965), Part I, 43. The dogs sparks and fire are illusion and shadow play, Wagner thinks. Like the traitorous spirit in *Arcana coelestia*, the dog attempts to lay a magical snare: "I seem to see deft snares of magic laid/For future bondage round our feet somehow," shouts Faust.. Ibid. 76; Engl. transl., 44. The circle narrows; he comes ever closer. It is later seen that it was Mephistopheles, before he let himself be known. When Mephistopheles reveals himself, Faust understands: "So this was what was in that cur." The poodles essence hid itself in the spiral.. Ibid. 85; Engl. transl., 55. Like Swedenborgs spiral-traitor, the poodle is an evil spirit who hides his true nature behind the innocent shape of a poodle and attempts to wind its way in by circling in spirals. It is not unlikely that the poodles spirals have a connection with the spiral traitor in *Arcana coelestia.* Goethe had read this work, and several other scenes in *Faust* also contain material he took directly from this work.

Swedenborg also describes the things in correspondence with the Grand Mans skin, hair and bones. Among the spirits in the skin of the Grand Man, there are those who correspond to inner states. This means that material things are in harmony with spiritual things. Swedenborg writes that among them one finds a beautiful sky-blue pattern formed in spirals and woven wonderfully together like lace embroidery in a way that defies all description.. *Arcana cælestia,* n. 5559. On the skin of a regenerated person, there are finer and more elegant forms than those just described. In contrast to this, the outer parts of traitorous and deceitful spirits look like clumps of snakes. But still worse is the appearance of the spiritual magicians, which is like that of rotten entrails. Later Swedenborg also saw some traitorous spirits who attempted to compel one of their servants to use his treacheries to influence him.. Ibid. n. 5989. They attempted to compel the servant to obey their commands, but they did not succeed in getting him to speak, since he was more treacherous than they. What he did, namely, was to roll himself into a spiral, and in this way was able to lead them astray.

However, in the spiritual world one does not go unpunished for the wrong things one does. The spirit who attempted to get Swedenborg to commit adultery was cast down into hell. There are also other fierce punishments in the spiritual world, among them what Swedenborg calls the "punishment of the whirl.". *Diarium spirituale,* n. 14851486 (March 18, 1748). This punishment involves being whirled around a wheel at a high speed. This punishment is meted out to those spirits who do not say what they think, but disguise their plans behind a mask of truths that they speak. Those who in addition genuinely enjoy evil and falsity become so vexed and tormented by their whims that they finally collapse into an insignificant organism composed of a continuous series of helical spirals. The spirits wrap themselves into spiral coils and writhe like a snake on an anthill. Swedenborg vouches for the truth of this because he himself has seen this many times in the spiritual world.. E. Swedenborg, *Vera christiana religio continens universam theologiam Novæ ecclesiæ* (Amstelodami, 1771); Engl. transl. *The True Christian Religion, containing the complete theology of the New Church as foretold by the Lord in Daniel 7:14 and in Revelation 21:23* (London, 1988), n. 578.

The snail-windings of the emotions

The spiral form of spirits can be referred to inner states. There are, of course, no real spatial relationships in the spirit world; everything that spirits see and do is actually a reflection of spiritual actualities, such as thoughts and feelings. However, even these can be understood as spiral forms. In the spirit world, the spirits thought and speech circulate almost in agreement with such snail-like windings as are found in the human brain, windings which Swedenborg had earlier noticed in his work *De cerebro.*

There are, says Swedenborg in *Diarium spirituale*, wonderful circulations, windings, bendings, inflows, returning loops that can never be understood, because they are in agreement with the winding forms in the spirit world.. *Diarium spirituale,* n. 27282731 (August 3, 1748). In heaven there are yet more wonderful snail-windings, as those of ideas, thoughts, speech and representative displays, which follow the windings that are in agreement with the celestial form, a form totally beyond the minds grasp. The emotions call forth these forms. These circulating motions are so wonderful that no one can ever grasp them even as to their most general form. Everything is dependent on God. Apart from him no circling windings, ideas, forms, laws, distinctions, relationships, species or order would exist.

Swedenborg also explains what these forms must be like in the thoughts respectively of evil persons and good. In *Sapientia angelica de divino amore et de divina sapientia* (1763) the spiritual aspect of an evil person is described as closed like a nerve fiber that contracts on touch or like a compressed spiral spring.. E. Swedenborg, *Sapientia angelica de divino amore et de divina sapientia* (Amstelodami, 1763); Eng. transl. *Angelic Wisdom Regarding the Divine Love and Wisdom* (Bryn Athyn, 1999), n. 254. Cf. *Vera christiana religio,* n. 258. The changes of state in the mind of the spirit take the spirals metaphysical form: before reformation or salvation it is a spiral that twists downward toward hell; after reformation it is instead a spiral twisting upward toward heaven.. *De divino amore et de divina sapientia,* n. 263. Thus it is this metaphysical

spiral that describes the souls wandering and return to the center of its being. In another religious context, the spiral can also symbolize resurrection. It is perhaps for this reason among others that the mathematician Jacques Bernoulli had a spiral carved on his gravestone, with the words "Eadem mutata resurgo." (Changed I will arise the same.). *Acta Eruditorum* (Lipsiæ, 1706), 44. The spiral became a symbol for the resurrection even for Leibniz. There was a metal spiral on his casket with the inscription "Inclinata resurget." (I bow myself, but only to arise.). Leibniz last assistant, Johann Hermann Vogler, mentions this in a letter written in 1716: "Bericht eines Augenzeugen über Leibnizens Tod und Begräbnis," ed. Paul Ritter, in *Zeitschrift des historischen Vereins für Niedersachsen,* vol. 81 (1916), 251. Swedenborg further imagines the natural and spiritual minds of the spirit as two intertwined spirals. The former is an image of the world and is the basis on which what is evil and false rest, and the latter is an image of heaven.. *De divino amore et de divina sapientia,* n. 270. Cf. *De amore conjugiali,* n. 203. The natural minds spiral moves from right to left, thus counter to the suns clockwise motion, and downward toward hell, while the spiritual move from left to right, thus clockwise with the sun, and upward toward heaven. The motion from left to right appears to reflect the common notion that a clockwise motion and consequently a clockwise spiral motion is of a higher order, in contrast to a counterclockwise motion, which implies opposition. Swedenborg could observe that this is the case in the spirit world. Evil spirits can move their body only from right to left, while good spirits prefer a direction going from left to right. Here, in other words, the spirits outer movement is in direct correspondence to their inner frame of mind.

In *Sapientia angelica de divina providentia* (1764), Swedenborg explains further about the spirals with the evil and the good.. E. Swedenborg, *Sapientia angelica de divina providentia* (Amstelodami, 1764); Engl. transl. *Angelic Wisdom Concerning the Divine Providence* (Bryn Athyn, 1981), n. 319. Those of the evil go backward and are turned toward hell; those of the good go forward and are turned toward the Lord. This spiral form is based on Swedenborgs description of thoughts and feelings as a kind of motion. More precisely, a persons feelings and thoughts are changes and variations in the state and form of the minds organic substances. How these changes take place and what they are like can be understood by a consideration of the heart and lungs. In these organs, there are alternating expansions and compressions; there is a spreading out and a drawing in, as the heart pumps and the lungs breathe. There are such motions also in the rest of the organs the body and in their small parts, where the blood and bodily fluids are transported back and forth. The variations and changes in the organic forms of the mind, that is to say, in a persons feelings and thoughts, are similar. However, the expansions and contractions of feelings and thoughts are more highly perfect than those that pertain simply to the body. Swedenborg emphasizes that these changes cannot be described in a natural language, but only in a spiritual one. But to what form of motion do these changes of state in thought and feelings correspond? It must be to the motion of the spiral: "They can be expressed only in words of spiritual language which indicate by their sound that these changes and variations are vortex-like inward and outward gyrations, after the manner of perpetually circling spirals wonderfully combined into forms receptive of life.". Ibid. Here his thought touches on the ancient conception of the spiral as the pattern of lifes weave, the symbol of birth, growth and death. Swedenborg himself felt these motions in his own thinking.. *Diarium spirituale,* n. 2318 (June 13, 1748). Cf. Ibid. n. 2846 (August 17, 1748). When ideas were springing up in his mind, they moved into a spiral path from left to right and arranged themselves with reference to a center. Swedenborg observed also that his own circulations were in rhythm with celestial respiration, the breathing of heaven, which was in a ratio with his of "3 to 1.". Ibid. n. 3989 (November 18, 1748).

The spiral stairways in Babylon

Not only can apirits, thoughts, and feelings manifest themselves in spirals and whorls in the spirit world, but even space itself and the imagination can take on this visible form. Things in heaven are actually a kind of representation or projection of the thoughts and feelings of the spirits. This representation may be the spiral and labyrinthine rooms belonging to the sorceress from east India who pursued Swedenborg for several weeks, or it may be whole cities which are sucked into the earth in a rotating whorl like that of a whirlpool around a hole.. Ibid. n. 4992, 5057 (undated). See also creations whorls in *Vera christiana religio,* n. 79. However, we also find every day motifsthe spiral staircase, which is also a classic exercise in drawing in the art of perspective. Another example of the spiral in art is the Tower of Babel. Following the Babylonian Ziggurat as a model, it winds its way in a spiral shaped pathpartly due to engineering considerationsupward to the builders workplace on the towers top. The Tower of Babel as pictured in the Old Testament (Genesis 11:39) is, of course, an expression of human arrogance and sin against God, which was punished by the confusion of tongues. In *Diarium spirituale* there is a description of a Babylon in the spirit world, a symbol there too of, among other things, mans greed and depravity.. *Diarium spirituale,* n. 52805304 (turn of the year, 17561757). The city is surrounded by high walls, but without any gate. To enter Babylon, one must therefore first climb a high mountain outside of the city. On the top of this mountain, there is a shaft that takes one down through it. One then follows through passageways and ascends continuous broad spiral stairways leading upward to the city.

The spiral passageway in Swedenborgs Babylon becomes a kind of inverted tower of Babel: here people go upward by underground spiral stairways. Their beloved riches the greedy inhabitants of Babylon store away deep under the city. One can reach these treasure chambers if one first goes down through a shaft and then follows meandering passageways and descends twisting, spiral stairways. Since Swedenborg, the former mining engineer, had seen the spirit worlds Babylon, he could also draw a sketch of its underground shafts and passageways.

A spiral stairway is mentioned also in *Delitiae sapientiae de amore conjugiali* (1768).. *De amore conjugiali,* n. 270. One morning Swedenborg awoke and asked himself where in the human mind true marriage love is seated, and where marital cold is. He was led therefore to the dwellings of marriage love as they exist in the spirit world, as they also may be seen in the human mind. In the highest (heavenly) region dwells what is good and its wisdom, in the middle (spiritual) region what is true and its intelligence, and in the lowest (natural) region what is just and fair with its related knowledge. The angels see this as a large three-story residence with apartments on each floor, joined by a spiral stairway. There the understanding with its truths can go up the spiral stairway as often as it wants to a room in the highest apartment. But if the will with the goodness of its love does not go up to its companion room at the same time, the latter remains closed, and coldness develops in the other, which is the coldness one finds in marriage. When the understanding feels cold toward his wife, he goes down the spiral staircase to the lowest apartmentif he dares. There he warms himself with illicit fire.

The spiral grove near Adramandoni

"A grove of palms and laurels appeared to me in the eastern zone, with the trees planted in rings in the form of spirals. Going over, I entered and walked along paths that curved around through several of the rings, and at the end of the paths I saw a garden, which formed the heart of the grove. Between the grove and the garden stood a small bridge, having a gate on the grove side and another gate on the garden side. I approached, and a keeper opened the gates. When I asked him what the name of the garden was, he said, Adramandoni, which means the delight of married love.". Ibid. n. 183.

Swedenborg walked into Adramandoni, and there saw olive trees, grape vines and flowering bushes. In the middle of the garden, on a circle of grass, were sitting a few young men and women and two angels. They were talking about married love. Adramandoni is the closed garden, the unopened chamber of maidenhood. In *De amore conjugiali,* we find such gardens, spiral-shaped like this one. The spiral becomes a picture of the innocent paradise which, like a labyrinth of long, meandering pathways, like lifes path of trial, leads in toward its inner yard.

In another garden, Swedenborg says, at first the spirits could not see the garden. They could see only a single tree with golden fruit and leaves of silver. But they were actually already in the middle of the garden, standing before the tree of life, the symbol of rebirth, the axis between heaven and earth. The angels then said to them, "This tree is in the middle of the garden. Go closer and your eyes will be opened, and you will see the garden.". Ibid. n. 13. Doing so, the spirits saw fruit trees and clinging grape vines arranged in endless circles and infinite spirals. The trees themselves formed a perfect spiral, where one kind followed after the other in rank of the elegance of their fruits. The innermost trees, having the finest fruits, were the most outstanding and were called Trees of Paradise, trees of species never seen, and that cannot grow here on earth. After them came trees whose fruits are used in the production of oil. Next, trees whose fruits are used in making wine. Then trees marked by their fragrance. And lastly, timber trees whose wood is used for construction. There were also gates through the spiraling rows of trees. If one wound ones way through any of these, one came out into brilliant flower gardens, which in turn led to lawn areas, divided into sections and beds. On seeing all this, the spirits exclaimed, "Look, a paradigm of heaven! Wherever we turn our gaze, some sight of a heavenly paradise comes flooding in that is beyond description!". Ibid. All the gardens of heaven, the angels said in response, are in their origin visible representations or images of heavenly blessings. Actually, the garden as a picture of paradise is a commonly recurring thought. The Greek word "paradeisos," what is more, means a garden.

We find winding paths even in Swedenborgs own garden at his home in Stockholm. He had had a labyrinth built of boards, where his friends children used to play. He had gotten the idea when in England. The paths in the spiral paradise gardens in the spiritual world are also like labyrinths. Such a labyrinthine paradise garden in *De amore conjugiali* forced the spirits to circle here and there in their wandering inward to the center. They only went round and round without finding a way out, and so came deeper and deeper into the garden. Observing their confusion, an angel said to them, "This paradisal labyrinth is really the entrance to heaven. I know the exit, and I will show you the way out.". Ibid. n. 8. True heavenly happiness lies, namely, not in what is physical or earthly, but in what belongs to the soul, in the unition of love and wisdom in useful service. It is not seldom in the history of art that the spiral and the labyrinth occur together; then both describe the longest way in to the center. Often the labyrinth, like the spiral, comes to symbolize lifes dangerous path through all the worlds difficulties, a grave test for the soul, a pilgrimage to the Holy Land, like the journey of Christ or the desert wandering in Exodus. The labyrinth also has the character of sacred inauguration, and sometimes deepest in, in the center space, one finds paradise. There is a variation on this theme of the labyrinth in Swedenborgs *Principia,* where nature itself is a labyrinth, in whose dark, blind alleys men of science could easily become lost.. *Principia,* 4; Engl. transl., vol. I, 6.

Like the gates in the paradise gardens through which the spirits were given an opportunity to enter, there were in Swedenborgs own garden similar entrances to another garden. There was another door, and if one opened it, one saw yet another door opening on a mirror that reflected back into the garden, toward a green hedge and bird cage. Swedenborg liked to say, obviously with secret humor, that if one succeeded in opening this blind-door, behind it one would find a still more beautiful garden. The art of gardening was one of his interests; perhaps he had a special liking for the baroque gardens strict geometry. In the renaissance and baroque gardens one finds parterres and ornaments that sometimes are of a spiral shape. However, also simply the fruitfulness of cultivated landscape, which has its parallels in the useful trees of the paradise gardens, seems to have pleased him. In a few travel notes made in August 1743 in the *Dream Book*, before it actually became the journal of his dreams, he was struck by the beauty of cultivated landscape. "On August 17, I left Hamburg, across the river Elbe, where for the space of some 10 km I viewed the most charming landscape I have ever seen in Germany; passing through a continuous orchard of apple, pear, plum, walnut, and chestnut trees, and also linden and elms." This succession of useful trees echoes the tree-lined way of the spiral in the paradise garden, from the finest fruit trees to those whose wood is used for construction.

The spiral in Swedenborgs thought, with its rich variety, changeability and soft curves, has similarities with the rococo periods emphasis on asymmetric and gentle, elegant lines. The rococos winding lines and stylized vine-tendrils can be seen in the periods arabesques and Dalecarlian wall paintings of gourds. Such an arabesque with a stylized, interwoven spiral pattern is at the end of Swedenborgs textbook on algebra, *Regelkonsten* (1718).

Another popular, curved form, the serpentine or "*figura serpentina,*" was developed under mannerism in Italian sculpture and painting during the 1500's, and reached its high point in the 1600's. We find an expression of the aesthetic interest in soft curves and serpentines in the middle of the 1700s with Hogarth. Like Swedenborg, he presumed a hierarchy of forms, from the least elegant straight line to that full of the most variations, the bending, winding serpentine line in three dimensions, "the line of grace." The serpentine, the foremost of all figures, embodied movement, expressiveness, variation, elegance and beauty. The illustrations by the reader of Swedenborg, William Blake, in his book *The Marriage of Heaven and Hell* (1790) are a later example of the serpentines aesthetic quality.

Conclusion

The search for Swedenborgs spiral took its beginning in the mathematical discipline of geometry. In his early compositions in the 1710s, the spiral was a geometrical figure consisting of concrete curves on a paper, curves that with the help of a mathematical formula could be described precisely. Here Swedenborgs spiral stands as an iconic sign. It had a graphic similarity with the ideal forms of mathematics. What he was interested in here was, to use semiotic terminology, the spirals denotation, that is, its core meaning or objective meaning, or in other words, he was interested in nothing other than the spirals purely geometrically demonstrable characteristics. The fact that the spiral particularly attracted Swedenborgs attention can to a certain extent be understood against the background of the 1600s and early 1700s great interest in curves, not least in mechanical curves like the spiral.

Archimedes spiral has been mentioned additionally as a paradigm for dealing with curves in the 1600s and as an important condition for modern kinematics, the science of a bodys motion independent of mass and force.. François de Gandt, *Force and Geometry in Newtons Principia* (Princeton, N. J., 1995), 203. These mechanical curves, which are formed by motion instead of by fixed points, were a challenge to geometricians, since they can be described only approximately and incompletely. Acquaintance with them was also helpful in astrodynamic and optical contexts. Several well-known mathematicians and physicists worked with spirals, among them Galileo, Descartes, Fermat, Torricelli, Newton, Leibniz, Bernoulli and many others. During the decades up to the dream crisis, Swedenborg distinguishes himself by his desire to always be in phase with the latest developments in science. In the same way as with the spiral, infinitesimal

calculus too was a popular subject; and it also was clearly in the forefront of Swedenborg thinking. The Archimedean spirals absence of fixed points and its mechanical, mobile and dynamic characteristics are features that recur in Swedenborgs spiral. Likewise, again and again we find the logarithmic spirals characteristic of infinity, its peculiarity of being self-reflecting, where part and whole dissolve into each other; regardless of which part one considers, one sees the whole.

Swedenborgs spiral also has a connection with a geometric ideal of science, a *more geometrico* method. The whole of reality is considered as a unified deductive systemone should be able to derive all theorems from a few axioms and thereby reveal the plan of the cosmos. With the aid of a limited number of starting points, such as Gods Providence, the mathematical point, spiral motion and a few others, Swedenborg attempted to carry out a universal synthesis, wherein the whole of reality would be embraced in a single theory.

This led to an expanded euclidian geometry, a deterministic system in which geometrical-mechanical laws with logical necessity produced the geometrical world of particles. Geometry in Swedenborgs philosophy of nature stood for order, clarity, reason and perfection. What is remarkable is the diametrically opposite place geometry was then given in the theological works. There geometricians striving for clarity and order was an expression of human vanity, finitude and foolishness. Man reasoned from the intestines grossest excretions; and geometricians, even with the aid of their most advanced tool, infinitesimal calculus, could not describe the very lowest and most disgusting elements in the human body.

In Swedenborgs philosophical works the Creator was ever an infinite geometrician, an infinitely good and perfect God, who by virtue of this endowed the world with the highest possible degree of perfection. The worlds perfection, Swedenborg maintained, consists in variation, the ability to change, the ability to give rise to ever more complex things. Thus the infinite Geometer draws up, constructs the finite world using the most perfect, beautiful and limitless geometric figure as a modelthe spiral. The world becomes a mirror of the most perfect figures. No other figure moves itself with greater freedom and ease than the spiral. It is the figure of figures and of eternal and spontaneous motion that contains and surpasses all the forces of nature. It produces all the worlds geometry and mechanism. But it was no longer a matter of Platos strict angular geometry, but of an "infinitesimal" dynamic. In Swedenborgs cosmogony the stiff, bounded straight lines of Platos bodies were exchanged for soft, constantly changing curves, where motion became one of the key concepts. Without motion, nothing could exist. Simply through the spiral motion of the point, anything finite could be created. The "Divine spiral" is at the same time a continuation of the doctrine of the "Divine circle." The spiral, the perpetuated circle, describes *all* circles in *all* dimensions and possesses perfection, infinity and eternity in a higher degree.

For Swedenborg the spirals stood for the archetypical form of the world, the creative power, the energy, in nature. It is the only suitable form of motion for natures most perfect things. It constitutes the connecting link between the micro- and the macrocosm, a motion that cycles from that points innermost endeavor, through the processes of the world of particles and on to the whorl of the universe. In his philosophy of nature Swedenborg seems to have glided over from the core meaning of the spiral to its associative and subjective meanings, that is to say, with a semiotic term, to its connotation, such as perfection, beauty, universality, etc. It is in this context that cultural and historical explanations are serious considerations. The characteristics that Swedenborg attributes to the spiral in his mathematical manuscripts can be understood to a large extent from a knowledge of the basics of geometry, while an understanding of the associative characteristics leads into complex cultural-historical explanations with references to, among other things, the geometrical ideal of science, the idea of a perfect circle and the conception of the world as geometric. Another historical starting point from which to consider Swedenborgs spiral is certainly the Cartesian concept of vortices of the ether. With Swedenborg, however, this concept was given universal validity. The concept of vortical motion could apply not only to the solar system but also to the particles of matter and human bodies. Thereby the spirals universality became significant in Swedenborgs effort to discover a harmonious, generally applicable and unified system that makes order in chaos. It is just through repetition that an artist creates unity and harmony in a work of art.

Consequently for Swedenborg the spiral was one of the repetitive concepts to be used to achieve a micro-macrocosmic picture of the worlda dynamic rule of law, where the macrocosms solar vortex exists in the spiral motion of the microcosm, in the shape of the nerve fibers, in the form of ideas, in the harmonic proportions of the membrane of the soul. All of the poles, equators, ecliptics and meridians of these geometric figures are in agreement and harmony. In the same way, there is a correlation between breathing, spiral motion and the universe.

Swedenborg saw spirals everywhere in animate nature, in the arched curve of the snail, the tissue weave of the brain, the blood, the heart, the muscle fibers, the cochlea of the ear. But behind these forms that the eye can distinguish, stretches a hierarchy of forms from the simplest angular form to something beyond the grasp of reasonthe perpetuo-spiritual form, the beginning of all forms. These forms have a place in a series or ladder of perfection, standing higher or lower depending on their relation to the universes origin in God. They are reflected in each other, and the higher up their position in the hierarchy, the more eternal, perpetual, free and full of variety they become. Swedenborg seems to have interpreted the different forms in the hierarchy as indices, as signs with a causal connection to something not present in themselves. They point to characteristics that exist in forms higher or lower on the scale. In considering this line of thought, we find that the idea of the long chain of being is united with the classical thought of an opposition between the earthly, straight line, and the Divine curve. The doctrine of forms becomes a Jacobs-ladder up to God, an echo of the Platonic idea that geometry leads the thought upward to forms that are above the senses and are Divine. All the forms on this ladder strive toward the supra- celestial form, and from this form the Divine streams down into natural forms.

The idea of a Divine geometrya supra-sensual, transcendent geometryand the thought of a symbolic content in geometric figures becomes increasingly prominent in his thinking. Already in his discussion of the physics of particles, we find the thought of the indwelling spiral motion of the point as being something that is impossible to describe with geometry, as something that cannot be proved using the senses. The doctrine of forms, in its turn, makes reference to a yet more diversified, supra-sensual geometry. We approach forms that only can be described using abstract language, forms that are inaccessible to reason. In the spirit world we can glimpse yet more transcendent, incomprehensible forms which surpass earthly geometric forms, forms of which only God can have a conception. In his teaching about spirits, in the same way as in his philosophy of nature, there is a dichotomy between what is geometrical and earthly, and what is non-geometrical and heavenly. Nevertheless, in spite of the absence of earthly geometry in the spirit world, that world is rich with figurative elements, all the way from the circular washing by Mohammedan spirits to the spirals in the layout of paradise gardens. Perhaps the spiral captured Swedenborgs attention, as it did in the case of many other scientists and artists, not only on account of its mathematical and scientific interest, but not least due to its aesthetic quality of beauty. It is a form that can be experienced as something living and expressive.

Swedenborgs dynamic esthetic, where the spiral constitutes the activating origin, is in phase with the rococo

ideal. They both have the same emphasis on variation and soft, changing curves. Besides the curved line, rococos asymmetry finds a correspondence in Swedenborgs spiral: it lacks a definite centerit has instead several centers. Center and periphery are everywhere and nowhere. Perhaps he was also fascinated by the spirals chaotic and drawing hypnotic power, which is manifested in the powerful swirling of the whirlpool, and in the twistings of traitorous spirits, winding in spirals so as to hide their true self and worm themselves into favor under an appealing guise of innocence. In his teaching about spirits, it is not the spirals iconic and beautifying character that is the theme, but rather its metaphysical and spiritual content. All that spirits see, all the visible objects in the spirit world, are really reflections of inner feelings and thoughts. Swedenborgs spiral, the spiral arrangement of spirits, the staircases and the gardens are really projections of spiritual states. There is a correspondence between the motions in the spiritual world and the *motions* stirred in the senses. In the spirit world, the spirits speech, thoughts and feelings circle in snail-like windings. It is motion in the senses, thus a changing of states, and by virtue of being motion it follows also that they describe space, extension and form. The spiral form of thought in the spirit world has its precursors in his philosophical writing. In connection with his concept of a universal mathematics, we found, among other things, that mens ideas have a kind of geometrical form. Through the determination of the spiral form of ideas, all knowledge, present as well as future, was attainable. All there is to be known exists in the spiral of ideas.

The spiral of the spirit world has the function of bringing together the visible world with the super-sensual. It became the connecting link between heaven and earth, where what is heavenly is the original, while the earthly is merely a picture or reflection of what is higher. In a similar way the spiritual mind of the good is turned upward toward God, while with the evil it is turned downward toward hell. The spiral thereby symbolizes resurrection and salvation, and stands as a sign of birth, growth and death. Furthermore, the spiral stairway is a connecting link between the different levels of the spiritual mind, just as the gardens of a spiral stand for the souls trying journey, the path at whose center is the kingdom of heaven. In the spirit world, the spiral functions as more than metaphorical language or allegory. It has no single meaning; it lacks the character of illustration or teaching. Neither is it linked with a comparable word and thus it is not merely a simile. The spiral bears rather the symbols characteristic quality of obscurity and ambiguity. It is something present, a geometric figure that represents something absent, a spiritual state. It goes beyond the thing it represents; its significance does not lie in its figure itself, it leads rather beyond itself. The symbol of the spiral is used to express something "inexpressible," something that escapes spoken language, and as such must be understood in a metaphysical and religious context. Swedenborgs spiral, as a symbol, is motion, change, a connecting linkthe meeting between what pertains to the senses and what is above them, the embodiment of what is inconceivable and spiritual, and points to a transcendent world, the immaterial world of spirits and angels.

Swedenborgs spiral had undergone noticeable changes. From having been a strictly geometric figure on paper, where the Archimedean and logarithmic spirals can be said to have constituted the prototypes, it became a super-sensual symbol in the spirit world. The spiral was in the beginning an icon, whose dominant significance was its denotation. It ended as a symbol. In the teaching on spiritual matters, the spirals core characteristics, those that were definable purely by geometry, fell into the background. Instead the connotation took over. What we have been following from mathematics to teaching on spiritual matters appears to be the development of a symbol. Nevertheless, during the whole course of this, Swedenborgs spiral treated always and everywhere of *motion*, but also of a change, variation and infinity. Swedenborgs spiral cuts through widely separated subject areas and thereby becomes also to a certain degree the connecting link between the two worlds, between geometry, science, aesthetics and theology. It was the most mobile, richly various, perfect, endless, beautiful and spiritual of figures. The spiral describes besides, the figure of the micro- and the macrocosm, the form of the bodys soul, fibers, ideas, euphoria, of all goodness, the Divine being, angels speech, the form of thought, feelings, salvation and paradise. All this is gathered in a picture in a few lines of the spiral.

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