

IV CONNECTIONS

The previous two chapters provided a review of some of the main features of the physical scientist's view of nature. In this chapter we attempt to show some points of connection between that view and a perspective from the Writings. However, as indicated in the initial discussion on the nature of science and revelation, there is no simple relation between the two sets of knowledges, and connections will always be somewhat the products of the minds which make them. Nevertheless we plunge into these subjective waters!

Levels in Nature—Discrete Degrees

The tables of force properties and level properties from chapter III show that a primary characteristic of nature is stratification, both as to material and structure (or substance and form to use Swedenborgian terms!). For example, atoms are larger and weaker in their energy of motion than those entities—electron, proton, and neutron—which make up the atom. Furthermore, there is a distinct differentiation between the layers, not just an "onion" effect of inner layers that are simply smaller replicas of the outer ones. In nature, the layers are each different, and any given layer is made up of various entities that are the building blocks of an outer and less energetic layer.

The layering described by science shares many properties with the structuring Swedenborg called discrete degrees. In the *Divine Love and Wisdom* No. 184, Swedenborg describes two kinds of degrees or layers: discrete and continuous, or distinct levels and gradient levels, the latter pair being the translation of G. F. Dole (Dole 1985, 42). In modern scientific terms the word "quantized" might be substituted for discrete. (Continuous still seems to retain the original meaning.) Yet discrete degrees imply more than just discontinuous entities (like the integers). Discrete degrees are characterized by a certain correspondence or functional relation between the layers.

For example the atom is a building block of the molecule, and the much more energetic proton is a building block of the atomic nucleus. In a more poetic vein the Writings state that "The first degree is the all in everything of the subsequent degrees" (DLW 196).

Since the Writings are a revelation, much of the discussion of layers or degrees relates to spiritual matters. Yet concrete images from the world of nature have an important role in the illustration of spiritual degrees. The form and structure of the human body is a primary illustration of spiritual things. Many examples of discrete layers in human anatomy are used. "All things which have existence in the world, of which threefold dimension is predicated, that is, which are called compounds, consist of degrees of height, that is, discrete degrees ... It is known ... that every muscle in the human body consists of minute fibers, and these put together into little bundles form large fibers, called motor fibers, and groups of these form the compound called the muscle. It is the same with the nerves...." (DLW 190)

One aspect of this quotation that further characterizes discrete degrees is the reference to a "threefold dimension." This refers, not to three space dimensions, but to a causative connection between the degrees, a progression of end, cause, and effect. The most inner level contains the purpose of the whole, the next level the operative cause, and the final level is the completed manifestation of the purpose. One might compare this sequence to others of this type such as the Aristotelian sequence of four causes. Nevertheless Swedenborg's description emphasizes the non-equivalent functional roles of the various discrete layers. There also may be groupings of levels. For instance, one possible grouping is (a) electrons and nucleus, b) atom, and c) molecule—each being the constituents of the next layer—the whole being dominated by the electromagnetic interaction. On a deeper level, perhaps the grouping, a) quark, b) meson, c) proton, dominated by nuclear forces is another possibility. In both cases the sequence starts with inner constituents and works outward to a less energetic state.

The layering of nature as to size, energy level, and function seems very natural in the present scientific climate. Probably the connection between this layering and the revealed concept of discrete degrees is one of the most fruitful and felicitous (at least for the present) connections of science and religion.

Force fields—Conatus, Force, and Motion

The connection between present-day views of force, or mutual interactions between objects, and the descriptions of such causative relations as given in the Writings is much less clear. There are many possible reasons for this lack of clarity. These include a) the present non-intuitive and sophisticated view of forces presently held in physical science, b) the state of interplay between experimental and philosophical methods which characterized 17th century science, and c) the fact that the revelation of the Second Coming was given through a man (Swedenborg) with a particular, limited, set of scientific knowledges. The non-intuitive nature of modern physical science has been demonstrated in chapters II and III. Let us elaborate the second and third points.

The 17th century was a period of great expansion of knowledge in the physical sciences as well as a turning point in scientific methodology. A reading of the history of these changes suggests an acceleration of knowledge similar to that which has occurred in the 20th century. (See for example, Dugas 1958.) At the beginning of that century science was practiced, in the main, as a metaphysical exercise, relying on methods that Aristotle had used in his discussions of motion. Scientific knowledge was created by reasoning from philosophical principles. A typical example was Johannes Kepler's early cosmogony of 1595 that assumed an imaginary relationship between the five regular polyhedra, and distances and dimensions of the known planets. Such reasonings were meant to provide explanations of material effects.

The experimental method was in its infancy, facing the entrenched clerical and other conservative interests, as suggested by Galileos experience. Unlike the present scientific method, the older philosophic method had no self-correcting mechanism. In particular one can identify three weaknesses in that early rationalistic, philosophic method: a) the possible use of incorrect first principles, b) possible faulty reasoning in any part of the development, and c) incorrect observation of the material phenomenon, or at least a misunderstanding as to the primary effect being observed. For example, in classical thought it was generally accepted as a rule of motion that all motion was damped or dissipated, unless a force acted to counter the dissipation. While this is the common observation it can be misleading since motion is only damped when there is a force acting to cause the damping. In outer space motion is essen-

tially undamped compared to motion in the atmosphere, where collisions of the object with the atmospheric molecules dissipate the energy of motion. Therefore the early observations were too limited to provide a check on the original "law" of motion.

Swedenborg's formal scientific education would have been in the classical mode. René Descartes spent the last years of his life in Sweden and his largely erroneous scientific ideas were influential at the University of Uppsala. While his presence had a liberating effect, his methods were those of the rationalist school. Although Swedenborg arrived at Uppsala long after Descartes' death and, in fact, was to develop cosmological theories of greater complexity than those of Descartes, the Cartesian influence seemed to remain dominant. According to his letters, Swedenborg read Newton's *Principia*—containing the foundations of modern science—although it is probable he did not accept its non-Cartesian implications. Therefore, in regard to physical science, Swedenborg took a path which diverged from that of Newton and later workers whose contributions to physical science have been stepping stones in the development of the subject toward its present form. (The case is quite different with Swedenborg's contributions to biological science. He came to these studies after his work in physical science, and his discoveries have been of lasting value. See for example, *The Brain* (1738), *Economy of the Animal Kingdom* (1744), and *Animal Kingdom* (1745).)

Where does this leave Swedenborg as a revelator in those passages of the theological Writings where some reference is made to physical forces, typically as a comparison with spiritual forces? Before attempting to answer that question it may be recalled from chapter I that the purpose of such discussions in revelation is the elucidation of spiritual matters rather than the prescription for a correct scientific theory. The next point, again made in chapter I, is that a revelator is not expected to use, indeed should not have, special, "advanced," knowledges which abridge the freedom of later generations to reject or accept a given revelation. These constraints suggest the possibility that some of Swedenborg's illustrations from nature may be flawed.

Lest the above paragraphs be interpreted simply as an apology for some lack of scientific accuracy in the Writings it should also be stated that most of Swedenborg's illustrations from nature are used conservatively and suggestively. This treatment contrasts markedly with the detailed and lengthy descriptions found in, for example, his pre-revelatory *Principia*. In the Writings there is a sense that Sweden-

borg is trying to suggest very complex spiritual ideas in an impressionistic or non-limiting way.

In fact, when natural phenomena are referred to, there is usually sufficient scope for several interpretations. One example is the often used sequence of Conatus (or Endeavor), Force, and Motion.¹ In this context the following quotation provides an example of this variability of interpretation.

Here, however, I choose to confirm... [the notion that power is manifest only in the ultimate layer of a set of discrete layers] only by the conatus, forces and motions in dead and in living subjects. It is known that conatus does nothing of itself, but acts through forces corresponding to it, thereby producing motion, consequently that conatus is the all in forces, and through forces is the all in motion; and since motion is the outmost degree of conatus, through motion conatus exerts its power. Conatus, force and motion are not otherwise conjoined than according to degrees of height, conjunction of which is not by continuity, for they are discrete, but by correspondences, for conatus is not force, nor is force motion,... consequently, there is no power in conatus alone, nor in force alone, but in motion, which is their product. (DLW 218)

Modern readers understand that forces cause motion but are perhaps less clear on the role of conatus. This word, meaning endeavor or tendency, was common in Swedenborg's time, and generally used in the sense of an anthropomorphic characteristic, a kind of vitalistic yearning of the physical system toward actuation of its capabilities. Because of its vitalistic connotation and the decline of vitalism as a scientific notion, conatus is no longer in current usage. Yet it is not clear that the vitalistic idea was the chief emphasis of Swedenborg's usage, and therefore a more modern interpretation is possible. As an illustration consider a massive object which resides in a space-time framework. The presence of the massive object generates (with the speed of light) a property within space-time called a *gravitational field*. The field has the effect of changing the properties of the surrounding space in such a way that any particle or wave (even light) will be affected by the field in that region of space. The impor-

¹ A comprehensive listing and cross referencing of passages with these words was done by Christopher D. Bown and is deposited in the Swedenborg Library at Bryn Athyn, PA.

tant point is that the observer will only detect the presence of the field if another entity, particle, or wave, is placed nearby. Then there will be a *force* between the two objects. This force will then cause a *motion* of attraction, thereby fulfilling the possibility inherent in the original gravitational field. The field takes on the role of conatus and is a necessary prerequisite for the existence of the force. As a result one has the natural sequence of field, force, and motion, paralleling conatus, force and motion.

Although we now commonly talk of a gravitational or other *field*, the field concept as a property of space-time belongs to the 19th century. Yet because of the non-specific usage in the Writings, the concept described by Swedenborg becomes a contemporary one. The sequence of field, force, and motion does form a set of discrete and ordered steps to the eventual realization of motion.

While this example may seem to contain a rather fine distinction, it does illustrate part of the challenge in seeking the interface of scientific and religious knowledge. Given the very complicated contemporary picture of the forces of nature it seems likely that a clear scientific/religious connection will be somewhat elusive.

Time and Space

"There are two things proper to Nature—space and time. From these man in the natural world forms the ideas of his thought, and thereby his understanding." (DLW 69) Unlike some natural entities—atoms, protons, and forces, for example—time and space are an intimate part of our knowledge-gathering equipment. They are the tools whereby the natural world is perceived and studied. As such, space and time are difficult to objectify.

Yet scientific issues of space and time were described in chapter III, and theological statements are made in the Writings. For example "God is omnipresent from first things to last of His order... God is in all space yet without space, and in all time without time, and consequently... the universe as to its essence and order is the fullness of God..." (TCR 63)

The Writings touch on several of the scientific questions about time. Some of these are: a) is there a beginning of time or has time always been?, b) is there a direction of time? and finally, c) will there be an end of time?

Let us start with the question of a beginning of time. In some ways it seems comforting to hypothesize that time always was, that

the natural world was created infinitely long ago, and therefore there is no need to deal with a "moment" of creation and what might have been "before" creation. Yet the present scientific theory of the big bang proposes a moment of creation and the following quotation seems to provide confirmation: "I [Swedenborg] was once myself in such a state, thinking about what God was from eternity, what He did before the world was created, whether He deliberated about creation, and thought out the order to be pursued; whether deliberative thought would be possible in a vacuum; with other vain things ... it was given me to comprehend that the eternity of God is not an eternity of time; and because time did not exist before the creation of the world, that it was utterly vain to think of God in this way... I concluded that the world was created by God, not in time, but that time was introduced by God with creation." (TCR 31)

It is evident from the quotation that time had a beginning, and that the question of "before creation" is meaningless. It also seems clear that a creation moment is implied. While this creation may have been of a natural world greater than the one we observe, there was nevertheless some kind of a beginning. Finally, both *True Christian Religion* 31 and 63 suggest that the eternity of God does not refer to some sort of infinitely long historical sequence, but an eternity which is more comprehensive than time, perhaps a "spiritualized" time dimension. But such speculation tends to seek a mechanism for the connection between spiritual and natural phenomena. In fact, the spiritual/natural connection is only described in terms of the correspondence relation (as with discrete layers) and no mechanical connection seems possible. (See the concluding chapter.)

There are some other suggestions in revelation of beginnings related to time. Processes which occur in both natural and spiritual situations have a sense of time flow or spiritual progression. They are characterized by birth and development, a prime example being man's growth which in turn typifies other processes. "...all things of the universe, viewed as to uses, represent man as an image..." (DLW 319). Man has a beginning with his soul (TCR 166) and continues to develop to eternity as a spiritual being. Insofar as the universe (macrocosm) reflects man (the microcosm) then to that degree the idea of a beginning of the universe seems plausible.

The notion of development leads naturally into the question of a direction or arrow of time. There are several ways in which time has an arrow. In physical science the increase of entropy (disorder) provides an arrow for time. Machines wear out, fuel is used up, and

so forth, as time goes on. There is a historical arrow of time by which we chronicle events in the past but have a degree of uncertainty about the future. This knowledge differentiation between past and future depends upon the existence of uncertainty. In the discussion of the mathematization of science several possible causes of uncertainty were listed; uncertainty in the initial conditions of a mechanical system and therefore its eventual outcome, intrinsic uncertainty prescribed by quantum physics, or just an overwhelmingly complex situation whose details it would be impossible to follow. In physical science the historical arrow and the increase of entropy arrow are related although the exact nature of the connection is a subject of current discussion. On a larger scale there is a cosmological time arrow associated with the expansion of the universe. The connection of this arrow to the other time arrows is also a subject of current discussion. (See Hawking, 1988.)

It now becomes obvious that there is a spiritual time arrow for man which follows his spiritual development. This process is very clearly irreversible in that everything he does becomes part of his being. Even in the spiritual world, as man's true nature emerges, some things are pushed to the side of his life, and yet they do not disappear entirely. And, most important, the choice for Heaven or Hell is eternally irreversible.

One might speculate that the only being for which there is not some kind of time arrow is God Himself. In the omniscience of God there is no distinction between future and past because there is no uncertainty, only complete predictability. In this case man's spiritual freedom is predicated upon his ignorance. Yet the question of man's free will is very difficult and this answer seems simplistic.

Is there going to be an end of time—an end to the universe for which time was originally introduced? Scientific cosmologists have provided a series of options which ultimately depend upon the amount of mass in the universe. If the universe contains less mass density than a certain known critical value then the universe will continue to expand indefinitely. On the other hand if the density is higher than the critical value then the expansion is slowing and will eventually reverse into a contraction phase. The contraction may lead to a big "implosion" which could reasonably be called the end of creation and the end of time. If the big "crunch" happened scientists state that only the mass-energy content of the universe in its raw, undifferentiated, unstructured form would survive. All complexity and structure from this creation would be lost.

From a theological perspective the notion of a cyclic creation is very difficult. For one thing it would destroy the microcosm-macrocosm connection previously alluded to. While man, the microcosm, lives as a unique individual to eternity, the universe (the macrocosm) would have only a finite temporal existence before being destroyed. Even if the universe were recycled as something else, all connection with the previous creation would be lost. Perhaps the most important theological argument for preservation of the universe to eternity is that the physical universe acts as a basis for the spiritual universe. This is true in both the collective sense and the individual sense. The Writings describe the need for some natural remnant of a persons earthly life to stay in the natural world as a basis for his history or memory. This natural remnant is necessary to give permanence to man's spiritual identity. While it may be difficult to picture the details of such a thing, it does seem clear that if a permanent natural basis for each persons spiritual life is required then it is necessary that the universe not end or be recycled. Perhaps most fascinating of all is the implication that the time and space natural world must be as permanent in the temporal sense as the non-space-time spiritual world.

(To be continued)

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