Edward F. Allen

Swedenborg's Philosophy as a Connected Whole

VI. The Three Bloods, Arteries and Veins, and the Formation of the Chicken in the Egg.

462. Summary of the contents of this installment. This set of Notes is concerned with the first three chapters of ***The Economy of the Animal Kingdom.***

Note 463 concerns the Introduction to *The Economy of the Animal Kingdom* (n. 1-28). The term "Introduction" here carries the usual meaning, but in the expression "An Introduction to Rational Psychology" (Chap. Ill of Part I of EAK) that word has a meaning distinctive to Swedenborg's philosophy. An "Introduction" here refers to a doctrine, called the "Doctrine of Series and Degrees;" thus it is not an introduction to a book "Rational Psychology." But on with the Introduction to *The Economy of the Animal Kingdom.* Its principal purpose is to explain that in his search for the nature of the soul Swedenborg is acting the philosopher, making inductions of causes from effects; the effects are in anatomy, the business of anatomists who have the peculiar gift of "experimental observation." Swedenborg, on his part, is devoting himself to "eliciting... causes," having "laid aside my instruments."

Note 464 is on Chapter I of *The Economy,* dealing with the "Composition and Genuine Essence of the Blood." Anatomy in Swedenborg's time was becoming a new science under the influence of the use of the new instrument, the microscope, just as astronomy had a century earlier with the help of the then new telescope. The blood corpuscle was observed to be composed of still smaller particles, or a "purer blood," so Swedenborg assumed the existence of a higher degree of the blood called "spirituous fluid." In Chapter I, the style of exposition is well illustrated consisting of three steps: first, to give a collection of anatomical facts reported as observed by anatomists; second, to give his induction from those facts, that is, to give causes from effects; and third, to give an explanation of the inductions together with still higher inductions, that is, to give causes of causes, often leading in ascending order to ends. Finally in the Note, is made an effort to interpret the Q.E.D. at the end of the Chapter.

Note 465 concerns Chapter II of *The Economy,* on "The Arteries and Veins, their Tunics, and the Circulation of the Blood." Besides the

anatomy involved, a number of things important later are introduced, almost by title only. The blood in its presence and flow throughout the body, and as containant of the purer blood and spirituous fluid, in general must perform two uses: 1. those that support the body itself; and 2. those that enable the body to act in the world as a result of psychological activities (in the brain or memory), imagination and thought leading to will to act. These two uses must be independent, that is, thought leading to will as exercised in the mind, are activities that must be independent from bodily ones.

Note 466 presents a brief enumeration of the inductions of Chapter III of *The Economy*. Then follows in Notes 467 and 468 some commentary on the "spirituous fluid" as a formative substance.

Note 469 deals with four remarkable changes of state that occur as the chick is formed in the egg and born. The first state is the state of the spirituous fluid; the purer blood and the red blood do not exist. The second state is when the beginning of the heart is observed. The third age arrives when a ventricle of the heart is identified—it may be called the age of the purer blood. The fourth age begins when the lungs begin to breathe air.

In concluding this set, Note 470 concerns bodily motions. Although there is only one motion in the body while it is being formed, there are two following birth, that is when the lungs begin to breathe air; but in the living animal body there are three sources of motion. The brain is the source of one of those three motions; and while it is being described, there is reference to "a machine like the brain."

463. Introduction to *The Economy of the Animal Kingdom.* What Swedenborg himself published of *The Economy* consists of two parts: Part I (of eight chapters), the first seven of which are published in English translation as Volume I; Part II consists of three chapters, which, together with Chapter VIII of Part I, are published as Volume II in English translation. The only reason I can think of for this is that the original publishers of the English version wanted to make the two volumes more nearly alike as to size than they would have been if published as to contents, wherein Volume I would have been Part I, and Volume II would have been Part II. Added to the confusion that is thus provided for the reader who is reading *The Economy* for the first time, there is another source of confusion that arises because of the appearance of the word "Introduction" both in the title of Part I, and as the heading of the first twenty eight numbers of *The Economy*. In the latter case it simply means what Introduction

usually means, and is the subject of this Note. "Introduction" in the expression "Introduction to Rational Psychology" is not an introduction in the usual sense, to the subject "rational psychology," but has a special meaning in Swedenborg's philosophy. On page **1** of Volume I of *The Economy* and again in the title of Chapter VIII as found in Volume II, "An Introduction to Rational Psychology," it refers to the means by which the study of rational psychology can be pursued. At first the "Doctrine of Series and Degrees" is meant. But later there are added other philosophical doctrines, such as the "Doctrine of Forms," "The Doctrines of Correspondence," etc. Note how in the full title "An Introduction to Rational Psychology" is a subject to be treated just as the blood is in Chapter I. The full title of Part I is: "The Blood, the Arteries, the Veins, and the Heart, with an Introduction to Rational Psychology."

The science of the blood is described as "the complex of all things that exist in the world, and the storehouse and seminary of all that exist in the body." The blood has an administrating capacity—its finest vessels compose the muscles, glands, and almost all viscera. The doctrine of the blood, although treated first, "is the last in the order of completion, presupposing, as it does, a comprehensive knowledge of those things that enter into and constitute the blood—" Hence many sciences are involved in a full consideration of the blood.

But however much a knowledge of the blood (the science of the blood) is required in *The Economy,* that knowledge is the knowledge of effects, philosophically speaking; and to pursue philosophy is to seek causes: "To a knowledge of the causes of things—in other words, to truths—nothing but experience can guide us" (n. 11). The exclusiveness of "nothing but experience" would soon be modified as Swedenborg got under way in his search for the soul. Even as soon as in Chapter I, but with considerable emphasis in Chapter III, he began to promise a doctrine, called "Doctrine of Series and Degrees" that is required to pursue the search, not only beyond the blood, but even beyond the entire experience to be gained from anatomy. The promise for the doctrine is given many times in the first seven chapters of Part I of *The Economy,* and even applications of it, but the formal description of it is reserved for Chapter VIII, that is, the final chapter of Part I, which hopefully will be the subject of the next installment of the Notes.

This brings us to the point of the Introduction, where Swedenborg tells us of his own place in what is to follow in *The Economy.* He

explains that there are two talents or peculiar gifts given to mankind; seldom are both in the same mind. There are those given to "experimental observation, and endowed with a sharper insight than others— There are others again who enjoy a natural faculty for contemplating facts already discovered, and eliciting their causes." Reasons are given why he will draw little upon his own experience, and instead depend on the anatomists for anatomy. So as to himself:

> When I essayed to form principles from these (their) discoveries, I thought I could detect in various other phenomena much to confirm their truth, although in reality they were fairly susceptible of no construction of the kind. I therefore laid aside my instruments, and restraining my desire for making observations, determined rather to rely on the researches of others than to trust to my own (n. 9).

I believe that *that* statement is one of the best known in Swedenborg's philosophical works, but least understood. That all of the volumes of *The Economy,* and *The Animal Kingdom* include many references and discussions on anatomy is evident even at a most superficial glance. First thoughts thence arising, and perhaps because interest is easier to come by in science than in philosophy, lead to emphasis on the study of anatomy itself in the philosophical works. But then the effort of the mind may be led away from the philosophical works themselves, to how that anatomy compares with anatomy of our day. Interest then may be directed to either how there are anticipations by Swedenborg *in science* ahead of his time, or dramatically in contrast to that, there are "failures" because of later discoveries. The mind that has become so directed is on the wrong path. It is only with great difficulty able to enter the philosophical adventure with Swedenborg in his search for the soul, with the necessary affirmative attention to it as philosophy. However, the mind with the philosophical bent is described by Swedenborg:

> The mind that has known this pleasure. . . is carried away wholly in pursuit of it; and in the kindling flame of its love despises in comparison, as external pastimes, all merely corporeal pleasures; and although it recognizes them as means for exciting the animal mind and the purer blood, it on no account follows them as ends... (n. 19).

The chapter goes on to explain how there are those of "opposite

nature" to those who experience delights in philosophical search (n. 20), or some who have the faculty leading to philosophical search impaired, even destroyed (n. 21), chiefly by the thirst for glory and the love of self (n. 22). Credit is given to ancients who gave philosophy its original existence (n. 23) and to the continuance of philosophy in later times (n. 24); and in all this there is a Providence acting (n. 25).

It is well to pause here to reflect on how important "divine end" as a subject was in *The Infinite* (see earlier installments) and to observe in anticipation of philosophy to follow, that, because of the nature of the affirmative attitude Swedenborg attaches to philosophy, his philosophy can be regarded as a philosophy of ends. As it will turn out, besides the attitude that leads Swedenborg to develop how the divine end can be obtained in man, it will develop that there are both "ends in the universe" and "ends in man."

464. Chapter I, The Composition and Genuine Essence of the Blood. Chapter I of *The Economy* illustrates Swedenborg's promise in the Introduction by beginning with anatomy as reported by anatomists: Leeuwenhoek, Lancisi, Boerhaave, Gulielminus, Malpighi, and Verheyen. Some of them report what can be seen by the microscope, a new kind of instrument available to science at that time; some report results working with evaporating dishes and "smears"; others report working with another instrument newly available at that time, the air pump, enabling observations of effects on liquids such as blood, while surrounding air is removed. Some, like Verheyen, working with chemical additives to blood to explore reactions. Even the beginning of team work so prominent in our day is in evidence as between Lancisi and Blanchinus who cooperate in certain observations. To read *that* part of Chapter I (see n. 29-35) is to be introduced to important facts about the history of science at the time Swedenborg wrote *The Economy;* but for our purpose it is important to know where he got the anatomical data as effects, from which he reasoned to causes.

Adleman, the author of five large volumes on Malpighi, acknowledges the historical meaning of Swedenborg's statements on the chick by quoting many pages both from the Latin and English editions of *The Economy.* On the other hand, the reader of *The Economy* might consider Swedenborg's limitations in regard to science (because of the primitive instrumentation of his day) as a "failure" in relation to what *we* can know on account of the wonderful develop-

ment of instrumentation in the twentieth century. But to stop at that point is to settle for lazy skepticism. Two challenges remain: First, to understand what Swedenborg *did* do with the science he had. That is to understand his philosophy. Second, when that is accomplished, and there is understanding of new sophisticated methods of investigation of the human body, then one philosophically inclined might well apply himself to a new attempt to search for the soul. This cannot be done by encasing one's self in a specialization, either in the science of our day, or in what was seen in the spiritual world, or even by reason, however well developed. This can be seen by the natural mind, and it illustrates what has been revealed of the trinal way, namely, will, understanding and use; one without the other two is nothing.

It is impossible to summarize the enumeration of facts as given in those pages (nos. 29-35); to know them is to list them. They have been selected by Swedenborg from the science of his day as effects, from which to determine causes by reason. Thus his philosophical method begins in experimental realism with regard to what can be brought to the mind by the senses. Aside from things about the red blood that can be thus thought, even from evidence by a moderately good microscope, Swedenborg's judgment about the existence of the "purer blood" rests upon what Leeuwenhoek and Boerhaave reported, seeing the blood corpuscle divided into six parts. For Swedenborg, the existence of the red blood and the purer blood depended on science. The existence of the spirituous fluid for him was an induction.

As is typical of most chapters in *The Economy,* Chapter I opens with a section on anatomical selections, followed by a section entitled "Induction." In a sense, all of Swedenborg's philosophy is contained in the Inductions. Nevertheless, its statements are so brief and broad, that explanations are required. In Chapter I, the initial statements quoted from the anatomists cover fifteen pages, the Induction two pages, and the pages commenting on the Induction, forty pages. Usually these are simply added following the Induction, but in this the first chapter they are introduced by the following explanation:

> Each of the clauses of this general induction, which furnishes the argument of the present chapter, we now proceed to examine carefully (n. 36).

And the first "clause" described is a sentence as subject of the next numbered paragraph.

> *There is a certain fluid of the highest degree of purity, called by some the animal spirit, which enters into the red blood as its principal substance, and which constitutes its vital essence* (1st sentence of the Induction, described in n. 37).

Although Swedenborg uses "animal spirits" later in *The Animal Kingdom,* in *The Economy* we find the term "spirituous fluid" instead. A summary statement follows treatments of successive clauses or sentences:

> 91. *From an attentive consideration of these things it may in some measure be evident, that the spirituous fluid constitutes the essence of life and activity proper to the blood, from which spirituous fluid then exists, through the medium of a copious volatile substance derived from the ether, a pellucid or middle blood. Lastly, through the medium of fixed and urinous salts, employed in tempering, copulating, determining, and finally, perfecting the composition, there emerges the red and heavy blood....*
> 92. *Into these original principles this latter kind of blood suffers itself to be divided according to degrees during its progress through corresponding vessels, or those first of a like order with itself, then through the capillary tubes, and lastly through fibres* (headings to nos.91, 92).

The conclusion of Chapter I is that *there are three degrees of the bloods:* red blood, purer blood, and spirituous fluid.

As is so often the case, when something significant about man is said in philosophy, there is reference to animals for comparison. So it is with Swedenborg in this case:

> But although the spirituous substance of every animal enters into all the genuine blood of the animal as its principal and only vital substance, nevertheless in every species of animal the blood is different, and varies in the individual subjects of every species, according to temperaments, states, and ages. Moreover there is both legitimate and spurious blood according to the health of the body.

Although the idea of the spirituous fluid is so important to his search for the soul, the importance of first beginning in the red blood is indicated by the final sentence of Chapter I of *The Economy:*

> Hence also there is not a single compound entity in the whole compass of nature, which is at once more simple and perfect than the sanguineous globule [i.e. the red blood corpuscle].

465. Chapter II. The Arteries and Veins, their Tunics, and the

Circulation of the Blood. In general the subject of Chapter II follows the means of circulations of the three bloods.

> As the blood itself is of a threefold origin, degree, nature, composition, and name, so is also the tunic of its vessels; in order that both the continent and the content may act as one common cause of determination . . . . Consequently, in the vessels, equally as in the blood and membranes, there are three degrees of composition to be taken into consideration, all of which should be distinctly perceived . . . . As both the blood and vessels are of threefold order, so also is every texture which is formed by the vessels; as, for instance, the glands... (163).

> In a similar order (of degrees) are carried on the secretions from the small arteries into the above glands; as well as the excretions ... (165).

To understand the circulations of the bloods requires complex study. For example, even the circulation of the red blood throughout the entire system of the body is such that the heart is not the only source to maintain that motion. It seems that this may have led Malpighi to make a study of the silkworm because in that animal circulation is maintained by a series of hearts through the system.

There must be a connection of flow of the bloods through the brain and the body, yet the effects in the brain (the seat of the mind) must be for the most part independent from those in the body.

466. The Induction of Chapter III of The Economy (n. 247) consists of eleven paragraphs, expressed here more briefly:

1. Although successive appearances of the formation of organs appear distinctly, at first there is no image ("effigy") of the final body.
2. What appears distinctly and successively in time can be understood in terms of use.
3. There must be a formative substance that looks to the use.
4. The nature and state of this formative substance is such that it is the cause of the forms seen in the body.
5. But the most superior force and substance is the soul, then follows in descending order the aforementioned formative substance called spirituous fluid, next the purer blood and finally the red blood.
6. Not only the spirituous fluid but the two bloods also are formative substances in their respective degrees.

7. There are four remarkable changes and diversities of state in the formation and birth of the body.

8. There are three general sources of motion: the brains, heart, and lungs. [Two of the motions, local or translatory, undulatory and modificatory, are treated or illustrated earlier, i.e. in *The Principia* theory, in *The Infinite* and in *The Economy* 1:169]. Animatory which is special to the animal body, is a principal subject in this chapter. Of special importance is the introduction to synchronous animatory motion of the brains and lungs, but distinct from the animatory motion of the heart following birth. The organic difference in man makes it possible for the will to be independent of motions.

9. However, the motion in the brain and the motion in the heart are coincident previous to birth. Hence at birth there is an essential change. In the womb or egg, governance is by the soul, which according to the language of series and degrees is "according to order." At birth when a will begins to form, and is thereby able to affect bodily motions the expression *inverted order* comes into use.

10. Although it is stated that there is no image (effigy) of the whole body (item 1 above) in the first thing seen in the formative process, nevertheless there is revealed in the primitive heart a state intended for the adult system of the heart, including the arteries as outlined in its proper place (see nos. 290-294).

11. That the process of formation is one of purpose is clearly stated in the final sentence of the final paragraph of the Induction: "All circumstances here recorded are most plain proof of an infinite and omnipotent divine Providence." It is clear from this that the Chapter is not anatomy or science, yet because there is dependence on anatomy for effects from which causes are induced, it is not revelation.

467. *There is a certain formative substance or force*... (from heading over n. 253).

In the formation of the embryo in the womb, or the chick in the egg, all things are carried on most distinctly. And the several members are produced successively, or one after another; so that there is no real effigy of the greatest in the least, and in the germ no type of the future body, no type which is simply expanded; for whatever coexists [simultaneously?] must become extant successively.

All things, thus produced successively, are fashioned in anticipation of, and according to, the use they are afterwards to perform.

This is taken from the headings over numbers 248-251, which in turn are taken from the first two items of the Induction. The title of this note is taken from the third item. The first three items of the Induction consist of the development of an example of the "Doctrine of Series and Degrees," culminating in the conclusion that there must be a certain formative substance that looks to use. This development will be given more in detail in the next set of Notes when the "Doctrine of Series and Degrees" will be treated. For the present, let it be sufficient to see that that development takes place as the first three items of the Induction (see Note 466) are treated, VI:3, and more briefly than above:

1. "there is no real effigy of the *greatest* in the *least."*
2. The dependence upon *successive* and *simultaneous,* language of the "Doctrine of Series and Degrees."
3. "in anticipation of and according to the *use* they are afterwards to perform," as summarized in number 253:

> A certain formative force or substance must preexist and be present while the embryo is formed in the womb, or the chick in the egg, in order that all things may be carried on most distinctly (n. 248), and in order that the several members, may be produced successively, or one after another (n. 249). By which force and substance all things thus produced successively, are fashioned in anticipation of, and accordance to, the use they are afterwards to perform (n. 251); and from which and for the sake of which they exist in their own distinctive manner (n. 252). And which also in no other manner represents to itself the state about to be formed than as if it were a state already formed; nor indeed the state already formed than as a state to be formed, etc. (n. 261).

468. ***"According to the nature and state of this formative substance"***

Once granting the existence of the spirituous fluid as the formative substance of the body, Swedenborg then enumerates general propositions that must be explored as to its nature and state:

1. *According to the nature and state of this formative substance, and suitably to its intuition or representation, causes flow into effects* (n. 265).
2. *[a]s appears from the different forms of animals* (266),
3. *[f]rom the imaginative force in pregnant females, causing corresponding marks on the little body of the embryo...* (267),
4. *[f]rom the formation of the brains, or the organism of the internal senses,*

as being different in different species of animals, and in different individuals of the same species (268).

5. *Whence it follows, that no condition of the organism is primarily the cause of the internal faculties, hut that that formative force or substance is the cause, whose nature, and the image of whose representations, determine the form of all things in the body* (269).

Finally there is this general proposition that relates the formative substance in a series of formative substances, by the words "veriest formative force." It begins,

6. *The veriest formative force and substance is the soul* (270).

In describing this part of the proposition, there is a return to describing the descending way, because to describe nature and state is to describe reality (ontologically); so in the description, the descending way is referred to as "descent from its principles [first things or ends] down the ladder of order." And in particular, the descending order is described (in n. 270) as to the body which is the lowest degree of the series:

> Wherefore every action of the body is the soul's action, so far as it is an action of the will, thus, an action of the reason, and this, of the principle of reason in which the soul is.

As to the soul which is the highest degree of the series:

> But as the soul cannot descend without intermediates into the ultimate compositions and effects of the body, because the soul is in the highest degree, and cannot from the highest flow into the lowest immediately (for which reason there is a subordination and succession of things, before there is any coordination and coexistence) . . . .

After which the general proposition is continued,

> *... next to the soul, in the order of forces and substances, is the spirituous fluid; next, the purer blood; and next, the red blood; which last is thus as it were the corporeal soul of its own little world.*

After some remarks on this, the general proposition begun at the head of number 270 is concluded:

> *Thus all these [i.e. the three bloods] may be called formative substances and forces; that is to say, each in its own degree; while the one vital substance, which is the soul, presides and rules over all.*

The heading of the next number continues.

> *Since, then, all things are thus most nicely subordinated and coordinated, it follows, that the spirituous fluid is the first cause* (n. 271).

And explicitly relating the three formative substances to causes, number 272 begins,

> That the purer blood is the second cause; and the red blood, the third cause, or the effect of the former causes... (272).

This introduction to the nature and state of the spirituous fluid implies that there is a nature and state of the purer blood and of the red blood. The use of nature and state opens the door to exploration of the spirituous fluid; it is not a finalistic conclusion. How important is nature and state of other things! Of the church for example? Of the country? Of society? And of philosophy itself? And of Swedenborg's philosophy? The answer to the last question, as I understand it, is the purpose of the present series of Philosophical Notes; namely, to try to understand the nature and state of Swedenborg's philosophy in respect to its connectedness and hence as a case history.

469. There are four remarkable changes of state as the chick is formed and born. The heading of number 273 is,

> Consequently, as the living creature grows successively in the egg or the womb, it passes through four remarkable changes and diversities of state. The first, when by the mediation of the spirituous fluid, the initiaments of the two brains and medullae are drawn and delineated.

The first age may well be called the age of the spirituous blood as a formative substance, not only because it is the time of visible beginnings, but because the purer blood and the red blood must still be formed. As reported by Malpighi, a new step begins after only six hours.

> *At the end of 6 hours,...* the rudiments of the carina and head of the chick were seen as a zone, swimming in a colliquamentum of leaden color, which was bounded by a circle that served as a kind of dam ... (273).

"Colliquamentum," far from being a highly technical term, is nothing more than a latin word for "fluid." A lead colored fluid enclosed in a dam was what Malpighi first saw, within which was a

keel shaped object named by the Latin descriptive word "carina." No organ was seen as yet, but after twice as long in incubation, that is, *at the end of 12 hours*... the carina is identified as the head and also there appears the beginning of the vertebrae. "Head" and "vertebrae" indeed are anatomical terms but at first not recognized as such, that is, not until after their shapes had more time to develop.

> [So] meanwhile this age is to be regarded as the first, or as the one in which the offspring first designs to visit the external world enjoyed by its parent, and by the rebirth of the parent in itself to secure the immortality of its kind. The period that precedes, or that exists before it comes into the ovum or uterus, is not one that is proper to itself, but common also to its parent; and from this has passed into the periods and degrees proper to its own nature, then the mother represents to herself the offspring as still in herself, or as still existing in the period common to herself. This appears to be the reason why she does not regard her offspring as being as yet the object of that nurturing care and love, which is afterwards the connecting bond between the two (273).

The second age reaches to the 28th hour when is seen what is identified as the first beginning of the heart, but seen a little more clearly at the end of the 34th hour.

> The third age does not begin till the heart puts off its simplicity . . . . "*On the 5th day of incubation,* one may without difficulty see
> the right ventricle of the heart The third age is more
> particularly that of the purer blood, as the second was that of the spirituous fluid.... *After the 8th day*... the heart pulsated in the usual manner, and the lungs of a white color were seen to have sprung up beside it" (n. 242) [says Malpighi]— Thus the first age of the lungs is the second age of the heart, or the third age of the brain and its spinal marrow. Whence it is evident that there is not a single member of the body but passes through its own distinct stages of existence... (277).

Thus the fourth age arrives,

> .. *.when the lungs themselves begin to breathe the air, which happens after exclusion from the mature egg, or the genital womb* (from heading over n. 278).

In number 278 Swedenborg added the recognition that there is

ignorance still concerning "experimental knowledge of the organization and functions of the several members," which may be interpreted as an invitation to someone skilled in 20th century knowledge about embryology to offer his or her services to improve this part of Swedenborg's philosophy.

470. Although there is only one motion in the body while it is being formed; there are two following birth; but there are three sources of motion.

> 279. There are three general sources of motion, on which all the particular sources depend; for what is general is requisite in order that there may be a distinct particular: the general in the present case is, the brains, the heart, and the lungs. The motion of the brains is called animation (see Parts II and III), and the action of the spirituous fluid depends upon it. The motion of the heart comprises systole and diastole, and on these the circulation of the blood depends. The motion of the lungs is called respiration; on this the circulation of the purer blood principally depends. But since the purer blood is intermediate between the spirituous fluid and the red blood, therefore its circulation depends upon the motions of the brains as well as of the lungs. On this subject the reader will find numerous remarks in the sequel. The motion of the lungs will be discussed in Part VII, on the Tongue, Trachea, and Lungs. In the meantime, with respect to the circulation of the purer blood, see n. 359, seq.

Actually, however, while the chick is being formed in the egg, and by analogy while the fetus is being formed in the womb, there is but one motion.

> 280. During the formation of the chick or the embryo, and previous to exclusion from the egg or the womb, the animation of the brains is coincident with the systole and diastole of the heart; but after the lungs are formed, and the chick or embryo is born, the animation of the brains dissociates itself from the motion of the heart, and conjoins itself with the respiration of the lungs. On this subject I must detain the reader for some little time, for unless these particulars are confirmed by actual facts, we cannot move a single step towards the theorems which are the following propositions: 1. That there is an animatory motion of the cerebrum, and with

> the cerebrum, of the cerebellum and spinal marrow, which motion has been called by some authors a systaltic motion. 2. That during the period of formation, this systaltic motion exactly coincides with the systolic motion of the heart. 3. That after the period of formation, or after birth, it conjoins itself with the respiration of the lungs. 4. But that it again conjoins itself with the motion of the heart whenever it returns into a state similar to that of formation, or whenever the lungs cease to respire while the heart continues to beat, as in cases of drowning, suffocation, obstruction of the gullet, trachea, and bronchia, in fainting, and so forth.

These four generals are treated in long numbered paragraphs that follow (nos. 281-287).

There are many beginnings in this chapter that are only introduced here, but are continued as philosophy develops in the search for the nature and state of the soul, some of which will appear in future notes. But one of them, unlikely so on first thought, is considered somewhat at length because it reappears so late in Swedenborg's philosophy, that is, in the Epilogue to Part II of *The Animal Kingdom.* It is the notion referred to as "machine."

> Now, a machine like the brain, which takes such a leading part in all the efforts, forces, and actions of the body; which is unwearied in its operations; which never ceases from the duties and cares resulting from its having charge of the body adjoined to it, must needs be always in the exercise of the highest activity, and experience alternate motions, in order that it may perpetually incite all those other parts of the body to action which are subordinated to it, and may vivify the fluid transmitted through the fibres. The truth of this circumstance we are shown by experience, and we are taught it likewise by the relation of causes. Nor is there any right to expect that we can ever arrive at a true knowledge of the cerebrum and cerebellum, the nerves, muscles, and viscera of the body, without first admitting the fact of the animation and alternate expansion and contraction of the former (n. 281).

As the search for the soul continues, much more is said by induction of causes from effects in anatomy, where causes lead in ascending order to the psychological activities in the brain, suggested by imagination, memory, thought leading to will, as mentioned above,

within *The Economy.* In fact the final chapter of what Swedenborg published of *The Economy* series, Part II, Chapter III, entitled "The Human Soul," is devoted almost entirely not only to those activities but also liberty, conscience, etc. It was at that point in Swedenborg's state of mind that he decided to write a book on rational psychology. But the manuscript was left incomplete for publication; it is now available in English translation by Acton and Rogers under the title *Rational Psychology.* (It was published in Latin by Dr. J.F.I. Tafel in 1849, and an English translation by Frank Sewall was published in 1887, under the title *The Soul or Rational Psychology.) Rational Psychology* is devoted to the series from the bodily senses to the soul. A very large part of that work is concerned with two of the intermediate degrees of that series, namely what is called the animus and the mind *(mens),* which is entirely concerned with activities of the mind. With that explanation, hopefully sufficient to give what is intermediate to the quotation about the brain as a machine, let us leap to where Swedenborg returns to that idea "machine-like." It is way advanced in the philosophical works, that is, in the second number of the Epilogue to Part II of *The Animal Kingdom.* Not only has the heart been treated as in the present part of *The Economy* into which the Notes have taken us, but by these the lungs and its system have been treated anatomically. So in the first number of the Epilogue it is explained that whereas in the embryo state in the mother's womb the motions proper to the lungs cannot take place, there is the suggestive clause that the soul itself was not highest in the scheme of things:

> Thus the body was the body of its soul, and the subject of the auspices of the supreme mind (A.K. 456). [See the introductory part of the number, to which are added three long footnotes in philosophical explanation.]

Then follows this description of how at birth the lungs are opened:

> But when the period of these destinies [i.e. while in the womb] had passed away, and the mannikin, bursting the swathings and bars of the womb, rushed forth upon the theater of the great world, the state of life was instantly changed, and the hinges of the determinations, forces and motions were inverted and bent backward against the order of the former life... (ibid.).

And here again there is a return to anatomy with reference to the first breath of life involving the larynx, trachea, bronchial pipes, muscles of the thorax, ribs, vertebrae and sternum, a change in the

flow of blood between heart and lungs, and the opening of the five senses (AK continues). Then in number 457, the whole body and soul together is referred to as a "machine":

> How when the body undertook to manage the reins which the soul relinquished; when the machine was so inverted that the powers flowed and rolled contrariwise, or upwards instead of downwards, then, in order that the machine itself might not be prostrated and perish by its forces. . . .

Then follow eight general propositions, all of which depend on anatomical effects. These propositions are then described (n. 457) and are referred to as being "provided and appointed that the lungs should perform a *mediatorial* office between the soul and body. . . . " Note well that in the above quotations the expression "inverted order" appears twice, and that is the term that connects the entire subject of the Epilogue to the foregoing treatise. After a rather detailed description of the subject of *intelligence,* in which there is a return to the triad of means leading to true philosophy (experience, geometry—rational philosophy and the faculty of reason, but in slightly different language), there is an essay on ends that involves the inverted order. By the fact that intelligence with its parts is introduced and there is return to experience, geometry, rational philosophy and reason, there is connection with the activities of the mind.

* * * * *

In my first effort on this set of Notes I tried to condense reference to the fact that the brain, as the seat of the mind, had two responsibilities: 1. that of governing the life of the body within the flow of blood, and 2. the governing of bodily actions by the will. The editor pointed out that the single paragraph in which that effort was carried out was confused and would not carry the proper message to the reader who was not already well indoctrinated in Swedenborg's philosophy.

By the addition of the above extended treatment, although incomplete in itself, I hope that even one being introduced to Swedenborg's philosophy for the first time will obtain some little light on its connectedness.

The Animal Kingdom II n. 464 opens with the clause "But for what end, it is asked, are the hinges of our life so completely inverted...?" When several years ago I read that question as it is given in full,

Arcana Coelestia 1902 came to mind, where it is explained how man is born into the world in an inverted state, and that "man's rational must be formed. . . by means of knowledges *[scientifica et cognitiones]* introduced through the senses, thus flowing in an external way, and so in inverted order." At that time I was interested in finding examples of what is said in *Intercourse Between the Soul and Body* (20), that spiritual truths are founded on natural truths. In this number it is explained how Swedenborg's philosophical period was preparation for his becoming a theologian.

Ignoring the danger of fragmenting the Notes on future philosophy beyond "The Formation of the Chick in the Egg. Etc," 1 will refer to one other reference in Swedenborg that might help to explain the dual use of the brains, as containing the mind, with regard to governance of the body. It appears in Chapter I of Part VII of *The Animal Kingdom.* That part of *The Animal Kingdom* consists of only two chapters, and is bound at the end of Volume II as published in English. It is the final publication by Swedenborg on what is strictly philosophical. The work available in English, *The Five Senses,* is an enumeration of topics to have been developed if *The Animal Kingdom* had been continued. The period of preparation to becoming Seer and Revelator was being entered into as Swedenborg wrote the Epilogue to Part II of *The Animal Kingdom.* The subject from Chapter I of the part of volume III which Swedenborg *did* publish is entitled "Organic Forms Generally." The principal subject is the statement and application of a "Formula on Series of Progression of Causes." It is applied to several organs—the liver, lungs, stomach, heart, and the cerebrum. In connection with the twofold function of the mind in the brain, it should be noted that in applying the rule to the cerebrum it is applied twice: once to what is called its "chemical office," and once to its "sensorial and motorial office" (546, 547). The former is anatomical in nature. So is the second, but on the way in application of the rule, it passes through what is sensed by the bodily senses to "memory," "images," thence to "intellectual ideas," and "thought determined by the will" leading to "actions."