

# REVIEW OF SWEDENBORG'S PARADIGM OF THE BRAIN\*

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We may sweat a thousand years and only scratch the surface of knowledge about the brain and how it works.<sup>1</sup>

## INTRODUCTION

Swedenborg wrote extensively on the brain and developed a unique paradigm of brain-body interconnection as part of a greater anatomically-based theory of soul-body interaction. He worked on and developed these ideas of fluid and fascial connections throughout the years of his anatomical studies, especially during preparation for his *The Economy of the Animal Kingdom* (also translated from Latin into English as *The Dynamics of the Soul's Domain*) and *The Animal Kingdom* (also translated as *The Soul's Domain*).

Swedenborg included a large section dealing with the brain in his first published work dealing with anatomy, physiology, and his philosophy of the human body, *The Economy of the Animal Kingdom*. His work on the brain in preparation for this book was written from 1738 to 1740. While a few sections were translated from Latin into English by Prof. Rev. George Bush in the early 1800s, it was not until 1938 that the entire work was

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<sup>1</sup> Swedenborg, *The Brain*, vol. I, § 104k.

translated by the Swedenborgian minister and scholar, Rev. Alfred Acton, PhD and published as *The Cerebrum*.

Swedenborg felt the need to revise his work on the brain, and developed his ideas further in a work dating from 1743–1744 in preparation for a later volume of his last published scientific work, *The Animal Kingdom*. Swedenborg never published this material as it was during this time that he started undergoing his spiritual experiences, and answered a call to explore and write on theological topics. This work was among the last of his scientific writings, was published posthumously as *The Brain* and translated into English by Leonard Tafel with volume one appearing in 1844 and volume two in 1847.<sup>2</sup>

Swedenborg's paradigms of the brain, brain-body interconnection, and soul-body interaction will be explored and described in detail in the following sections. While he did go on to write extensively about such things as correspondence and soul-body interaction in his later theological writings, this section will focus on the paradigms he developed in his works on the brain, with an emphasis on his mature ideas found the work *The Brain*. These will then be compared and contrasted with Sutherland's cranial concept.

Swedenborg was an enthusiastic student of the human form in his search for knowledge about the soul. His goal in his anatomical works was to pursue matters of soul-body interaction intellectually, to convince those who doubted the existence of the soul by exploring and describing the anatomic basis for its reality and its manifestation in the body.<sup>3</sup>

## SERIES OF DEGREES

The first important concept in Swedenborg's "The Brain" is that of series of degrees. This concept permeates his anatomical works, especially in regard to the brain, and helped him to develop his unique insights. Later it became a key concept in his theological writings also.

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<sup>2</sup> Acton, Introduction to vol. III, *Dynamics of the Soul's Kingdom, The Fibre*, xvi; Acton, Introduction to *The Cerebrum*, xxvii–xxviii; Woofenden, *Swedenborg Explorer's Guidebook* (West Chester: Swedenborg Foundation, 20\*\*), 63–68.

<sup>3</sup> Swedenborg, *The Soul's Domain*, vol. I, § 23.

Swedenborg described each great series of degrees as having three levels consisting of a higher, a middle, and a lower. He termed the highest degree in a series the "end," the middle degree the "cause," and the lowest degree the "effect." Thus every series of degrees contains an end, a cause, and an effect. From the highest degree, the highest, most universal things flow into the lower degrees. The lower degrees are in turn representations of the higher degrees.<sup>4</sup> Swedenborg does occasionally use other terms for these same concepts. He sometimes describes degrees as spheres, with the highest degree containing the sphere of "principles" (ends), the middle degree the sphere of "means" (causes), and the lowest or last the sphere of "ultimates" (effects). These series of discrete degrees can thus be described as end, cause, and effect or as principle, means, and ultimates (ultimate determinations from the principles through causes).<sup>5</sup>

First degree	End	Principle
↓	↓	↓
Second degree	Cause	Means
↓	↓	↓
Third degree	Effect	Ultimates

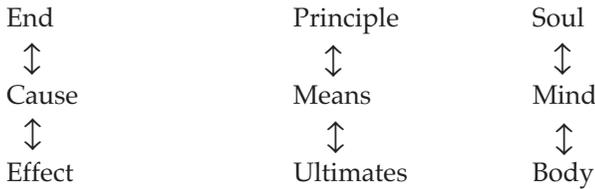
### CORRESPONDENCE AND CO-ESTABLISHED

An important corollary to this concept is that of co-respondence or correspondence. The highest degree in any series contains the principle, or end, that has respect to those things that are below it in that series of degrees. It disposes into action the lower degrees that in turn represent the principles contained within it. While these degrees are discrete, there is an influx from the higher degrees into the lower ones. There is also a reciprocation or reflux from the lower degrees up to the higher ones. Swedenborg names this "co-established harmony," or correspondence, which exists simultaneously between these degrees of end, cause, and effect. Therefore the third degree consists of effects that are a "type and image" represent-

<sup>4</sup> Swedenborg, *The Brain*, vol. 1, §1-2.

<sup>5</sup> *Ibid.*, §§ 1-7.

ing the corresponding things contained in the highest degree of principles. One important series is that of soul, mind, and body.<sup>6</sup>



### USE

Another fundamental approach of Swedenborg's is his focus on use. The use, or function, of anything is of great importance, for that is why it exists. Anatomically this is clearly seen in Swedenborg's focus on structure and function as being two aspects of a single entity. However, he believed that it is only by a study of their functions that we truly come to understand the anatomical structures of the human body. The use of something determines its degree-location in a series with others and reflects the end or principle made manifest in its use. All ultimates in the body originate from and reflect back to the soul. "Thus all things that belong to the body, and that flow forth into act from the body, manifest to the life the quality of the soul."<sup>7</sup>

### INTERCONNECTEDNESS AND MOTION

Swedenborg not only viewed the body as interconnected with the mind and soul via discrete degrees, but he also recognized the interconnectedness of all the viscera and structures within the body, by further series and degrees. He saw the brain as the great connector and prime mover having its own intrinsic motion that was primary to lung motion and that "excites the body and all its viscera into a similar perennial motion." He understood the body to be intricately connected through anatomy and function at many levels including the neurologic, musculoskeletal, visceral, and fascial. All these levels are interconnected, but the

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<sup>6</sup> *Ibid.*, §§ 1–2.

<sup>7</sup> Swedenborg, *Dynamics of the Soul's Kingdom*, § 32.

underlying uniting force is the soul's presence in the body and not in just a in a static way. The major mechanism for this interconnection operates through motion, especially in the brain and its animation of the body.<sup>8</sup>

## BODY AND SOUL

One of Swedenborg's goals in much of his work was to discover more about the soul-body interaction. This theme runs throughout his scientific and theological writings and is fundamental to his view of the brain. He describes body and soul in the paradigm of discrete degrees. The soul is the end or highest principle in a series in which the body is the effect, ultimate, or final form. Consequently, the human body is the image of the soul and is organically formed in accord with its principle. He goes on to write, "wherefore by the one [the human body] we are able to behold what is contained in the soul, and from the soul what is contained in the body." He describes soul and body as an organic unity separated by discrete degrees.

While the soul may not be detectable by natural senses or instruments, it nonetheless corresponds with the body and forms the body, and the body is a vessel for the soul. The intrinsic order and wisdom of the soul guides the influx, structure, and function of its vessel, the body, via correspondence. The inherent wisdom of the structure and function of the body originates from the soul. This single unity of the human form is an image of the Creator who is Divine Wisdom itself.<sup>9</sup>

## SOUL, BRAIN, AND BODY

Swedenborg recognized the brain in general and the cerebrum in particular as the link between the soul and the body. He saw that degrees of end, cause, and effect applied to this series. Just as the end is the purpose, the cause is the means by which the purpose is carried forth, and the effect is the final result, then so the soul is the sphere of purpose, the cerebrum is the sphere of causes, and the body is the sphere of effects. He

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<sup>8</sup> Swedenborg, *The Brain*, vol. I, § 104o.

<sup>9</sup> *Ibid.*, §§ 2, 65, 104q, 195.

understood the body to be intricately connected through anatomy and function at all levels with the underlying uniting force being the soul's presence in the body. The major mechanism for this to take place is the motion of the brain and its animation of the body.<sup>10</sup>

### **BRAIN MOTION**

Swedenborg described brain motion as a subtle alternating expansion and contraction. He often referred to this motion as an alternating diastaltic and systaltic motion, or as animation of the brain. He clearly believed that knowledge of the motion of the brain is necessary to understand its structure and function. In a rare instance of humorous writing he wrote the following to illustrate the importance of knowledge of brain motion:

Without a knowledge of the motion of the brain we should remain in doubt as to the various diseases, especially of the head, and we should not know how to point out their causes, and on seeing and observing the changes in the opened brains we should stand agape and wondering, as a donkey before a machine set in motion by the wind or water. Without this knowledge [of brain motion] also we should know nothing whatever in psychology; we should not know what the soul is, what the mind, the understanding, the will, and what the exercises of each are; for in order that the soul may live corporeally or by a body, the brain or everything organized must be moved or animated in alternate periods.<sup>11</sup>

Swedenborg saw evidence for brain motion throughout the anatomy of the brain, spinal cord, and nervous system. He saw evidence of this intrinsic brain motion in the structures of the dural and other intracranial membranes, as well as the cranial bones and the sutures uniting them. He stated that this animatory motion is found throughout the entire nervous system and in fact the whole body. Swedenborg described every artery,

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<sup>10</sup> *Ibid.*, § 80.

<sup>11</sup> *Ibid.*, 59.

vein, and nerve fiber as "in the very current of motion of the brain." This motion is perpetual throughout the life of the body.<sup>12</sup>

Swedenborg described the subtle alternate expansion and constriction of the brain as a global movement occurring throughout it. He stated that there is animatory motion of the individual parts of the different areas of the brain. However, these different structures move together in a "harmonious variation" so that the brain contracts and expands in a simultaneous fashion. This is accomplished by a spiral quality of the movement of discrete areas of the brain, which he described as a "spiral fluxion." This spiral fluxion allows each part to move without obstruction of contiguous structures. This activity helps to explain the structure and shape of the cortical gyri. He stated that this motion is subtle and not obvious to the senses.<sup>13</sup>

Swedenborg described brain motion as extending through the brainstem to the spinal cord. The spinal cord and brainstem extend and contract, expand and constrict, in conjunction with the motion of the brain, and especially of the fourth ventricle.<sup>14</sup>

### **BRAIN MOTION IS PRIMARY TO LUNG MOTION, "RESPIRATION" OF THE BRAIN**

Swedenborg described the animatory motion of the brain as usually coinciding with the ventilation of the lungs. However, he made it clear that brain motion is primary to lung motion. In his own words, "The motion of the brain is the first in order and that of the lungs is last."<sup>15</sup>

Swedenborg also makes reference to the animation and "respiration" of the cerebrum. At one point he even writes, "The cerebrum alternates its motions and breathes and respire with the lungs" This is primary to respiratory motion.<sup>16</sup>

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<sup>12</sup> Ibid., §§ 43, 59, 260, 277.

<sup>13</sup> Ibid., §§ 43, 46, 48, 104r, 350.

<sup>14</sup> Ibid., 51; vol. II, § 708.

<sup>15</sup> Swedenborg, *The Brain*, vol. I, § 53; Swedenborg, *Dynamics of the Soul's Kingdom*, vol 1, § 283; vol II, § 9.

<sup>16</sup> Swedenborg, *The Brain*, vol. I, § 41; Swedenborg *The Cerebrum*, § 213.

## ORIGIN OF BRAIN MOTION/ANIMATION

Swedenborg wrote that while the principles of brain motion are hidden deeply, the source of the motion is the cortex of the brain, particularly the cerebral cortex. Brain motion is also tied in with the spirituous fluid arising from the cells of this cortex (spirituous fluid concepts are discussed more in following sections). However, the primary origin of brain motion is from the soul which is the source of the spirituous fluid essence. Swedenborg viewed brain motion as a manifestation of the soul's presence within the body. Thus, his use of the word "animation" can be understood as the vivification of the natural body, and simultaneously as the rhythmic motion of the brain permeating the entire body that makes this vivification possible. Swedenborg viewed this activity as uniting the discrete degrees of soul, mind, and body, allowing influx and correspondence between these levels. He saw human life as a triunity united by influx and correspondence. He recognized the rhythms of organic motion permeating our natural bodies as also playing an important role uniting soul, mind, and body. Life is motion—rhythmic, coordinated organic motion—occurring at all levels.<sup>17</sup>

## BRAIN, INTRACRANIAL MEMBRANE AND CRANIAL BONE MOTION—A TRIAD

Swedenborg described the motion of the brain as part of a complex system of inter-related systems. Not only does brain motion affect all the structures of the body that are continuous with the brain, it also interacts with contiguous structures in a very sophisticated and complex fashion. Brain motion is intimately tied in with the structure and function of its surrounding membranes and the cranial bones.

Although not described by Swedenborg as a series of discrete degrees, the motion of the brain, membranes, and cranial bones can be seen as a triad. He described the brain as the prime activating, moving force. He recognized the surrounding membranes, particularly the dura mater, as

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<sup>17</sup>Swedenborg, *The Brain*, vol. 1, §§ 58, 56.

serving as an elastic reciprocating mechanism that transmits this motion to the cranial bones, causing passive cranial bone motion.<sup>18</sup>

### RECIPROCAL DURA MATER MOTION

Swedenborg states that the animatory motion of the brain causes corresponding motion to occur in all three layers of the intracranial membranes, pia, arachnoid, and dura mater. All of these three membranes are interconnected in a wonderful way so that each of them is involved in activities throughout the central nervous system, especially the brain. However, the most significant role is played by the dura mater. The dura connects and regulates brain and cranial bone motion. The dura has the characteristics of elasticity and reaction. It helps to sustain the regular intervals of motion between the soft, highly active brain and the hard and less active cranium.<sup>19</sup>

Swedenborg described the dural motion as reciprocal with brain motion. Dural motion is passive, following the motion of the brain, yet also, "by virtue of its elasticity, and in its capacity as a muscular tendon, it contributes in a general way to the reciprocal expansive motion of the brain". When the brain is in the expansion phase, the dura mater is stretched; when the brain contracts the dura is "unstrung." From this alternating stretch and recoil results a "reciprocal action." This reciprocal stretch and recoil is rhythmic, having a "reactive power," responding to and affecting the alternating cycle of brain expansion and contraction.<sup>20</sup>

Reaction and elasticity are required in order that it [the dura mater] may concur in a general manner with the motion of the brain; for when the latter has reached the extreme bounds of its expansion, then the dura mater urges it to enter upon the reciprocal period of its contraction.<sup>21</sup>

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<sup>18</sup> *Ibid.*, §§ 260, 277.

<sup>19</sup> *Ibid.*, §§ 247, 260.

<sup>20</sup> *Ibid.*, §§ 250, 286c, 353.

<sup>21</sup> *Ibid.*, § 261.

## THE FOUNTAINHEAD OF DURAL MOTION

The area of the meeting place of the venous sinuses, named at Swedenborg's time as the Torcular Herophili, is along the straight sinus that passes from the occipital bone along the junction of the dural membranes (falx cerebri, falx cerebelli, and tentorium cerebelli) towards the pituitary gland, which is housed in the sella turcica, located in the center of the sphenoid bone. Swedenborg described this area along the straight sinus and junction of tent and falx as the first source of the expansile motion of the entire dura mater and its processes. He recognized this area as the site of the greatest concentration of cerebral forces and motion. Swedenborg described strong cords, similar to muscular tendons, along this part of the dura mater. He termed this area as the "general fountain-head of motion" of the dura. This area was later named by Sutherland's students as the "Sutherland Fulcrum."<sup>22</sup>

## DURA, PLEURA, PERITONEUM COMMUNICATION AND WHOLE BODY FASCIAL CONNECTION

Swedenborg described the dura mater as enclosing the brain, regulating brain motion, and communicating this animatory motion not only to the cranium, but also to the rest of the body. He stated that this is accomplished by the dura enveloping nerves communicating to pleura, peritoneum, and into the "sphere of the body." He recognized that this covering of the nerves continues to all muscles, sense organs, and viscera. In this manner the influence of the brain, via the general membranes of the dura, continues into the pleura and peritoneum, and thus the whole body. In a more modern vocabulary this same idea can be described as a body-wide system originating in the brain and its surrounding dura and extending through fascial connections throughout the body via the central and peripheral nervous systems, pleura, peritoneum, viscera, muscular system, and sense organs. Swedenborg describes this as a "general envelope"

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<sup>22</sup> Ibid., §§ 104 i, 251, 333; William G. Sutherland, *Contributions of Thought: The Collected Writings of William Garner Sutherland*, 2<sup>nd</sup> ed. Editors., A.S. Sutherland and A.L. Wales (Portland, Oregon: Rudra Press, 1998), 237.

which sounds surprisingly similar to such modern ideas as tensegrity. In summary, brain motion transmitted by the dura mater and related neural fascia extends throughout the body.<sup>23</sup>

### CRANIAL BONE MOTION

Swedenborg recognized cranial bone motion as passive and secondary to the primary active motion of the brain. He stated that the structure of the individual bones of the head reflected the motion of the brain. He described these bones as moving in a cycle of expansion and contraction in harmony with the motion of the brain. Swedenborg emphasized the priority of studying brain motion first and from there moving on to the study of dural membrane motion and lastly cranial bone motion. In his words,

It is better, however, to explore these very motions and states from their efficient causes in the brains themselves than to study them from the signatures and traces in the external tables of the cranium.<sup>24</sup>

The cranial bone sutures were noted by Swedenborg to demonstrate the motion and "sphere of activity" of each individual bone. He recognized that the details of the interdigitations and articulations of various sutures reflect the many different motions of the cranial bones.<sup>25</sup>

Swedenborg recognized that there are many different individual motions of cranial bones that take place simultaneously with the rhythmic expansion and contraction of the cranium. He described three general centers of cranial bone motion. These are between the crista frontalis and the crista galli, at the middle of the occipital bone, and at the center of the sphenoid bone. He stated that the most general and important center of all motion of the cranial bones was in the sphenoid. He describes this sphenoid center as "the complement of all the functions of the cerebrum," for "the individual bones communicate only with the sphenoid."<sup>26</sup>

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<sup>23</sup> Swedenborg, *The Brain*, vol. 1, §§ 59, 78, 104o, 272.

<sup>24</sup> *Ibid.*, § 196.

<sup>25</sup> *Ibid.*, §§ 191, 198; Swedenborg, *The Cerebrum*, vol. I, §§ 170, 736; vol. II, § 9.

<sup>26</sup> Swedenborg, *The Brain*, vol. I, §§ 191, 251.

Swedenborg also described an axis of motion which runs from the middle of the occipital bone, the meeting place of the cerebral sinuses, through the straight sinus to the middle of the sphenoid. This sphenoid-occipital axis is a crucial axis determining much of cranial bone motion and function.<sup>27</sup>

### INDIVIDUAL MOTION OF THE FRONTAL, PARIETAL, AND OCCIPITAL BONES

Swedenborg describes the movement of the cranial bones in general terms. These movements accompany the rhythmic cycle of brain motion. He describes the movements of only three bones in particular; the frontal, the paired parietal, and the occipital bones.

Swedenborg described the frontal bone, with its bilateral anterior bosses, expanding anteriorly during the expansion phase of brain motion, in correspondence with the frontal lobe of the brain. He described the paired parietal bones as elevating and moving laterally with the expansion of the parietal areas of the brain. He also described the occipital bone moving with the cerebellum, elevating at the middle.<sup>28</sup>

He does mention that while the movement of this system extends throughout the body, it is subtle and not obvious to the senses.<sup>29</sup>

### INTRERCONNECTION BETWEEN ALL BONES OF THE BODY, INCLUDING CRANIAL BONES

Swedenborg observed that the entire skeletal system is connected in such a way that each bone sustains the rest and “as it were feels whatever happens to the other; and thus it receives in part the force brought to bear upon the other; especially if any casualty happens to the cranium.” He also commented that the cranium is conjoined indirectly with the vertebrae, ribs, sternum, scapulae, sacrum, and extremities.<sup>30</sup>

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<sup>27</sup> *Ibid.*, § 191; vol. II, § 572.

<sup>28</sup> *Ibid.*, vol. I, § 198.

<sup>29</sup> *Ibid.*, § 350.

<sup>30</sup> *Ibid.*, § 194.

He made some brief comments about a study of "Theoretical Osteology" as a vast, but sublime undertaking to study the general motion of all the bones of the body. Unfortunately, he did not do this before leaving his anatomical works and moving on to theological writings. He did mention that there is a mild "general motion" of all the bones of the body that corresponds with the animatory motion of the brain. He stated that the correspondence of these with brain motion is absolute and is most evident in the bones of the cranium and vertebral column. Swedenborg's emphasis on structure and function with a focus on use helps him to see the skeletal system as functioning and moving as a single unified whole, and moving with the underlying cranial rhythm.<sup>31</sup>

### SPIRITUOUS FLUID (SPIRITUOUS ESSENCE/ANIMAL SPIRITS)

Swedenborg described the finest structures of the cerebral and cerebellar cortex as cerebellula with fibers extending throughout the brain connecting the cortex to the rest of the body. This is clearly similar to the structures in the modern concept of cell theory in the form of neurons and nerve fibers. However, he described a function that is not recognized today.

He described the individual cerebellula as producing a most refined fluidic substance he termed the "spirituous fluid" or "spirituous essence" (also "animal spirits"). The terms are sometimes used with different shades of meaning, but in general Swedenborg refers to a special fluid-like substance arising from the cells of the brain cortex and travelling through and around connected nerve fibers and so throughout the entire body. He also described the spirituous fluid as traveling from the cortex through and around nerve fibers into the ventricles where it mixes with fluid from the choroid plexus to form the cerebrospinal fluid, yet retains its own special character. He described this animated cerebrospinal fluid as then traveling to the third ventricle and from there to the infundibulum and body of the

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<sup>31</sup> Swedenborg, *The Cerebrum*, vol. I, §§ 38, 40.

pituitary gland, as well as to the fourth ventricle and spinal cord. He described this fluid as eventually passing into the venous blood stream.<sup>32</sup>

The spirituous fluid, as described by Swedenborg, is more subtle and refined than other fluids found in the body. He explained that the character of the spirituous fluid is different from regular fluids in that it is volatile, highly elastic, expansile, compressible, and yielding. It can flash through the interstices and pores of the medullary substance.<sup>33</sup>

Swedenborg stated that this special character or “moisture” of spirituous fluid imparts fluidity to body fluids, including the cerebrospinal fluid and the blood. This spirituous fluid is “utterly beyond the ken of the senses” and is a “first determining force, however light.” He describes spirituous fluid as penetrating into the cortical fibers and being secreted into ventricles as well as the glands of the body in ways that no eye is able ever to perceive. This spiritual fluid infills other fluids while still retaining its unique character. It is intimately tied in with brain motion. Both brain motion and spirituous fluid derive their force and power from the same origin, which is the soul.<sup>34</sup>

The soul is described by Swedenborg as pouring in, or breathing into (or inspiring), the spirituous fluid, thus animating the cerebrum. The soul is the “veriest cause of the animation of the cerebrum.”<sup>35</sup>

Swedenborg mentioned the spirituous fluid as having a *potency*, something more than could be derived from nature alone. He recognized the source of this potency as the soul made manifest in the animation of the brain and in the spirituous fluid.<sup>36</sup>

### CEREBROSPINAL FLUID ANIMATED BY SPIRITUOUS FLUID

Swedenborg described cerebrospinal fluid as a mixture of simple fluid and spirituous essence. This fluid is generated from the venous blood by the choroid plexus that lines the ventricles of the brain. Spirituous fluidic

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<sup>32</sup> Swedenborg, *The Brain*, vol. I, §§ 58, 104 n; vol. II, § 518f.

<sup>33</sup> *Ibid.*, vol. II, § 577.

<sup>34</sup> *Ibid.*, vol. I, § 58; vol. II, §§ 518f, n. 577; Swedenborg, *The Cerebrum*, § 214.

<sup>35</sup> *Ibid.*, *The Cerebrum*, § 214.

<sup>36</sup> *Ibid.*, §§ 38, 90, 214, 725, 730, 731.

essence is produced by the cerebral and cerebellar cortices and transmitted to the cerebrospinal fluid via nerve fibers at the choroid plexus, which results in a vivified cerebrospinal fluid. Modern science confirms the production of cerebrospinal fluid by the choroid plexuses from venous blood. The concept of spirituous fluid or essence is not known today.<sup>37</sup>

Swedenborg described the cerebrospinal fluid as being animated by the spirituous fluid, which originates from the cerebrum. This spirituous element vivifies the cerebrospinal fluid. It is the fluid within the fluid that gives it a special character. The cerebrospinal fluid eventually mixes into the blood stream giving the blood some of its own special character.<sup>38</sup>

### PULSATION OF CEREBROSPINAL FLUID

Swedenborg described the cerebrospinal fluid as being moved by the animatory force and motion of the cerebrum and cerebellum. He described its flowing from the brain cortices to the lateral ventricles, to the third and fourth ventricles and to the spinal cord in a pulsatile fashion synchronously with brain motion. He also described the cerebrospinal fluid as traveling between and through the roots and fascicles of nerves, and along and around them, to the rest of the body.<sup>39</sup>

### THE CIRCLE OF LIFE

Swedenborg described a circulation of the spirituous fluid. He wrote that this circulation starts with the production of the spirituous fluid in the brain cortex where it is transmitted by nerve fibers and cerebrospinal fluid to the rest of the body and eventually terminates in the bloodstream. The blood then completes the circulation, returning the spirituous fluid back into contact with the cortex of the brain where it is extracted and rejuvenated by influx from the soul. Thus it completes "the circle of life" that is animated by the expansion and constriction of the brain, contributing a universal motion to the spirituous fluid and the entire body.<sup>40</sup>

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<sup>37</sup> Swedenborg, *The Brain*, vol. I, §§ 70, 104 n.

<sup>38</sup> *Ibid.*, §§ 90, 104 n; vol. II, § 715 n.

<sup>39</sup> *Ibid.*, vol. I, §§ 104v, 471, 473, 527; vol. II, § 715 n.

<sup>40</sup> *Ibid.*, vol. I, §§ 75, 78.

## LYMPHATICS

Swedenborg also saw a connection between the spirituous fluid and the lymphatics. He described the lymphatics as playing an important role in receiving the spirituous fluid and transmitting it to the blood. He saw the lymphatics as carrying spirituous fluid which vivified the refined lymph that they contain. The lymphatics serve a role in “redeeming” the spirituous essence and restoring this to the blood. He described the blood “eagerly” imbibing the chyle and lymphatics because of their containing the spirituous fluidic essence which in turn animates the blood. Swedenborg described the lymphatics as carrying “the noblest progeny of the blood and the serum” serving as “the nurse, the vehicle, the bed and throne of the spirits, with which it is richly endowed and vivified.”<sup>41</sup>

## VENTRICULAR MOTION

Swedenborg describes the ventricles of the brain undergoing a similar phasic motion with the cerebrum, cerebellum, and brainstem. During the contraction phase of brain motion, each lateral ventricle lengthens and narrows, and the brainstem lengthens. The posterior and descending cornua of the lateral ventricles (which he also calls Ram’s horns) subside and close up, with the upper, broader parts of the lateral ventricles becoming narrow and contracted. This overall brain and ventricular motion correlates with a subtle narrowing and lengthening of the cranium during the contraction phase of cranial motion. Therefore, the opposite is true during the expansion phase, with a subtle widening and shortening of the cranium taking place.<sup>42</sup>

Swedenborg described changes in the shape of the third and fourth ventricles. He described these as expanding and contracting with cranial motion, stretching longitudinally and compressing into long narrow fissures, and then widening and shortening back again during the alternate motions of the brain.<sup>43</sup>

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<sup>41</sup> Swedenborg, *The Soul’s Domain*, vol. I, §§ 162, 167, 286, 293.

<sup>42</sup> Swedenborg, *The Brain*, vol. II, § 466, 469.

<sup>43</sup> *Ibid.*, vol. I, § 527; vol. II, § 715.

## MOTION AND ACTIVITY OF THE FOURTH VENTRICAL

Swedenborg also describes more than just the cyclic change in shape of the fourth ventricle with the animatory motion of the brain. He describes the fourth ventricle as imparting to its surrounding areas the power of manifesting the intrinsic "vital motion" and activities of these centers. He describes how the animatory motion of the fourth ventricle facilitates the action of all the local nerve areas of the floor and walls of this ventricle to promote the appropriate actions to the rest of the body "flowing into each nerve root action all the way out to the periphery of the body."

He goes on to state that the fourth ventricle is "as it were a balance-wheel and regulator of the motion, not only of the medullary caudex, but also of the roots of the nerves, entire phalanxes of which burst out in this neighborhood." Swedenborg recognized the fourth ventricle as playing a key role in regulating the function of the autonomic nervous system via contiguous sympathetic and parasympathetic nerve centers. In his words, "The vagus and great sympathetic are also tied into the function of the fourth ventricle." He also states that the alternate motions of the cerebellum and spinal cord are dependent on the function of the fourth ventricle.<sup>44</sup>

In summary, Swedenborg describes the cyclic activity of the fourth ventricle as playing a key role in the distribution of the cyclic animatory brain motion to the rest of the nervous system, serving as a regulator of this motion that occurs universally throughout the body.

## SPINAL CORD MOTION

Swedenborg described brain motion as extending through the brainstem to the spinal cord. The spinal cord and brainstem extend and contract, expand and constrict, in conjunction with the motion of the brain in general and the fourth ventricle in particular.<sup>45</sup>

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<sup>44</sup> Ibid., §§ 705, 707, 715a, 715f.

<sup>45</sup> Ibid., vol. I, § 51; vol. II, §§ 708, 709.

## SUMMARY OF SWEDENBORG'S DESCRIPTION OF THE BRAIN

While difficult to summarize such a complex paradigm, some of Swedenborg's ideas do stand out:

1. The concept of series of discrete degrees illustrated by the example of soul, mind, and body and their correspondence and interaction in an organic whole.
2. The focus on structure and function with an emphasis on use.
3. The primary importance of inherent brain motion, in a subtle alternating expansion and constriction, which originates in the cortex and is transmitted throughout the body, serving as a means for soul-body interaction as well as rhythmic animation of the entire body.
4. The reciprocal motion of the dural membranes (accompanying the rhythmic motion of the brain) transmitted by dural connections to the cranial bones as well as the fascial connections of the pleura, peritoneum and nerve supply to the rest of the body.
5. The specific motions of individual cranial bones determined by cranial sutures and the motions of the corresponding dura and brain.
6. The interrelated function of bones throughout the body and their general corresponding motion to that of the brain.
7. The role of spirituous fluidic essence transmitted from the cerebral cortex to the nervous system, the cerebrospinal fluid, and eventually to the blood and other body fluids.
8. The potency of the spirituous fluid and the special quality that this fluid imparts to the cerebrospinal fluid as well as to the blood and other body fluids.
9. The pulsatile nature of the distribution of the animated cerebrospinal fluid, including the role of the ventricles of the brain in distributing this throughout the nervous system and entire body. The fourth ventricle in particular serves a role in regulating and facilitating this process.
10. The rhythmic motion of the spinal cord, extending and contracting, expanding and constricting, in conjunction with the motion of the brain in general and the fourth ventricle in particular.
11. The holistic nature of this phenomenon with the cyclic activity of the

brain originating in the cortex and affecting all organs and systems throughout the body. This animation is primary to, but often in synchrony with lung ventilation, occurring at a more subtle level. This vital motion is transmitted by neural connections throughout the central nervous system to all organs and the entire body, as well as by fascial connections through the dura, pleura, diaphragm, pericardium, pericardium and nerve fiber sheaths, and by fluid connections through the spirituous fluid animating cerebrospinal fluid, blood, and lymphatic fluids, and even to all bones of the body.

Swedenborg's organic paradigm is inherently holistic, based on fluid and fascial principles, integrating brain function and motion, the neurologic, fascial, skeletal, respiratory and cardiovascular systems, as well as soul, mind, and body into a single rhythmic unity. His organic paradigm is not simply a philosophy of ideas, but is based on detailed anatomic study, with an emphasis on structure and function, and is consistent throughout his writings.