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THE NEW PHILOSOPHY

A Quarterly Magazine devoted to the interests of The Swedenborg
Scientific Association.

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THE NEW PHILOSOPHY.

THE NEW PHILOSOPHY is a quarterly magazine devoted to the exposition of the scientific and philosophical principles contained in the works of Emanuel Swedenborg, and as the organ of the Swedenborg Scientific Association it will be the means of promulgating the uses undertaken by that body. The magazine will contain essays on Science and Philosophy; instalments of some of Swedenborg's Scientific works; and the transactions of the Association.

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This Association was organized on May 27th, 1898, for the following purposes :

I. The preservation, translation, publication and distribution of the Scientific and Philosophical works of Emanuel Swedenborg.

II. The promotion of the principles taught in these works, having in view likewise their relation to the science and philosophy of the present day.

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THE NEW PHILOSOPHY.

VOL. III.

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ON THE SENSES.*

PART FOUR OF "THE ANIMAL KINGDOM"

BY EMANUEL SWEDENBORG.

I.

PROLOGUE

1. WE have treated of the viscera of the lowest or abdominal region, as also of the superior or thoracic region: order requires that we treat of the members of the highest region, or that of the head, accordingly of the sensory organs, the cerebrum, cerebellum, and of the medullas both of the head and of the spine.

2. Let us therefore ascend by an analytical way, from those things which, if you please, are lowest and which as it were rest upon the earth, to those which rest upon the middle and as it were sublunary region; finally to highest things, which constitute a kind of heaven or Olympus, where with her nymphs resides Pallas, who is said to have been created from the brain (of Jove). We must ascend to highest things as it were by the rounds of a ladder; that way in the meantime must be cleared, that the descent may be easy; for when we have mounted by an analytical way from postreme or posterior things to superior or prior things, and when we have explored the quality of that which is in the superior or prior world, then we are furnished as it were with new Mercurial wings, in order that we may be

*Translated by Prof. Enoch S. Price, A. M.

able to descend safely, and without error, and thus synthetically, and not by errors and hypotheses, from prior to posterior things.

For when we mount up even to superior or first things, then we are enabled (*licet*), as if from the top of a mountain or of Parnassus, or from a high tower or in a mirror (*speculo**), to examine those things which are below distinctly or together, and to imitate the most far-reaching sight of superior beings which regard all mundane things, as placed below them, at one look, and embrace both worlds together in the same sight. For when we have emerged to superior things, then we as it were put off the animal nature and put on the truly human, and, if I may so say, the angelic; then first we are rational men; nor do we, like worms, walk and creep upon the ground, and seize only those things which are obvious to the senses, and consider them alone useful. We are gifted with a sublimer mind; but we have not trodden the way which leads us thither, which is the analytical alone; for the way is broad, and of immense labor so long as the senses instruct us; from these we ought to be removed, and to sojourn as it were above ourselves in our spiritual sphere, which is truly intellectual. How arduous this ascent is, is known to everyone who is carried away by the pleasures of the senses and of his body; for these things must be as it were put off, and interior pleasures adopted in place of them, the sense of which we do not have before we have obliterated the former by the service of time.

3. We have promised that we would next treat of the heart, arteries and blood, then of the members of both sexes ascribed to generation, as also of the conception and formation of the fœtus.

But further than what has already been said of the heart, arteries and the veins and blood, in the little work which I have called the *Economy of the Animal Kingdom*, the matter having been carefully weighed, we find that we cannot proceed thither immediately and next in order, for all things of the body teach what the blood is. In order that we may investigate the blood, every nook and corner which that traverses must be traversed,

*If this word were *specula* it would mean "a lookout," which would seem more in keeping with the series.—TR.

namely, the viscera of the abdomen and of the thorax, and especially the brain; for the blood is the universal essence of the body, to be collected from all the viscera, whatever each one has in its bosom, and whatever nature it bears. Universal things are prior. Especially the cerebrum is to be investigated, whither the blood returns as to its native soil, and where it is again resolved into its principles, and, as animal spirit, enters into the fibres, and completes the circle of its life. Besides, in the blood there are not only the elements of the kingdoms of the earth, but also of the animal spirit; and in this the soul itself resides which creates the life of the blood. Unless these things are first examined we shall stick in the arena, and talk about infinite things which are said to be in the blood, which knowledge we have not yet acquired; wherefore unless it is first evident what the brain is, what the compound and simple fibre, what the animal spirit and what the soul is, we speak only unknown things, and, just as if we believe that infants understand what one says, we produce only formulas, when yet we must penetrate more deeply than to words and the coverings and pictures of things, of which every one favors his own, thus infinitely diverse ideas. No science consists in terms, but in the notion of the thing which is within the terms.

4. A similar reason occurs in regard to the explanation of the genital organs, as also of the formation of the *fœtus* in the ovum; for the genital organs, especially of males, are ascribed, not to the blood, but to the spirits, which circulate through the fibres and adjust themselves to the most perfect forms of nature, and to these they so adapt the very life or soul of the parent soul, that the genital fluid or seed thence formed is suitable for producing what is similar; since therefore it is thus far still unknown what the animal spirit is, and what the soul is which has that life in it, surely examining the organism would be unraveling the instrumental, without a knowledge of the principal cause, when yet the organic or instrumental, together with its principal make one cause; wherefore I do not see that I can proceed thither, or explain the genital members before I shall have taught what the brain is, what fibre, what spirit, and what the soul is; which is the reason that now I ought to further set

aside that exposition of those members; for as was said it would be to offer only words not understood, and rather to involve the science in shadows, than to bring it out of the shadows.

Hitherto the understanding has examined only the wonderful things of the senses, as one looks through the windows at what is done in the streets; now the senses shall examine the more wonderful things which are off the streets, within in the by-ways.

Hitherto we have investigated wonderful things by the external senses only; now you shall see more wonderful things, when we look into the causes of things, and the interlacings of the fabrics:—and still purer things—if by sense we can contemplate those supreme things, which also we shall try, but only in stupor with a dislocated knee, (*sed modo per stuporem eluxato genu*). But in a double sense we shall contemplate the wonders of God, thus not as animals, but as men and rational beings.

Induced by this reason, I wish first by our analytical way, by means of anatomical experience, and by doctrines which shall lead us by the hand, to arrive at a knowledge of the soul; and so to clear the steps, that finally we can return, and, as it were, descend to those organs; for the analytical is to ascend, and afterwards thence to descend, leaning upon those same ladders by which we ascend, for there we borrow wings.

5. Furthermore these genital organs themselves are as it were organs of a more perfect nature; for they are the exercise grounds of the loves, and the very native land or Cyprus of Venus, thus the Olympus of all delights, to which things we can not come except *a priori et superiori*; for they are the centers of all pleasures and, as it were, dwelling places of a higher life; for they have for their end higher loves, which, descending from the soul herself, respect the procreation of human, and the propagation of heavenly society. Wherefore, they are altogether above the sphere of those organs which constitute inferior things; we ought thus to descend to those organs but not indeed to ascend by them to higher things. The genitals are also separate from the rest of the viscera, and constitute a region of their own or a central one of the body itself, as, for

instance, the testicles and the rest. Yea, we do not come to the use of these members until about the youthful or rather adult years; then also they constitute another and as it were more lovely, happy and heavenly life, as appears in insects, which, while worms live a long time for the appetite and the stomach, but finally put off their first life and put on this life of venereal love, when, under another form, they are furnished with wings, as are bats; they then sport above the earth in the atmosphere, as in their heaven, and give attention to procreation. Therefore we leave this part as yet, until we shall have come to a knowledge of superior things, and have grown a little older in the knowledge of things, imitating in these things nature herself who teaches us the way.

6. In the meantime we shall study and investigate analytically the organs of the senses, then the cerebrum, the cerebellum, and their two appendages or medullas; these conduct us into the entrance hall to the senses and interior lives, wherefore to the knowledges of our mind and soul; for she there resides as in her own organism or in her own causes, from which as from a centre and beginnings she can rule the whole circumference, and all effects; as also the interconnection of things, experience, diseases, affections and single things teach. Finally we shall search out the way by new doctrines, which as bridges are to be built, in order that we may be able to ascend from the organic world to that heaven which the soul inhabits. Without these aids we labor in vain, for there is no passage except with new doctrines as guides, which doctrines shall, with God's help, be next presented.

(To be Continued.)

NOTES RELATING TO THE LARGER PRINCIPIA.*

BY EMANUEL SWEDENBORG.

BEING EXTRACTS FROM HIS JOURNAL OF TRAVELS DURING THE YEAR 1733.

1. *On My Preface to the Principia.*

Imagine a man devoid of education, left all to himself, growing up with wild beasts and with apes, or, if you will, without the companionship of any animal; alas! would he not be like a brute? What would he discern naturally? What sort of operation would there be, in more adult age, of his better aura (*aura melior*), or mind (*animus*), into his bodily organs; or, of his organs into his mind? Education alone makes and forms man, and distinguishes him from brutes; it alone perfects, and fashions as it were, the organs communicating between the soul and the body; it alone disposes the elements, and forms the delicate membranes, so that the most subtile motions may pass backwards and forwards upon them; it discloses, as it were, those hidden approaches and windings leading to the most subtile active ens of the animal; it alone unfolds the oracles of the august mind. The delay which man suffers in his development perhaps especially contributes, as an essential means, to the formation of such organs and motions, in the most subtile pores of the membranes; for we continue to develop during the space of fifteen or twenty years and more, while the larger, more robust, and muscular animals, do so during three or five years only; meanwhile our organs are yielding and soft like wax, and are able to receive and gradually and regularly adapt this very simple motion to themselves; so that, as long as they are in the process of becoming hardened, the traces, and the elements or figures of the motions, are able to be fashioned therein. Or, if we may assume the principle from things which are most subtile and simple, it is known that these arise, and are gradually adapted,

*Transcribed and translated from the Photo-lithographed copy of the original Latin Manuscript by Rev. Reginald Brown.

round about the parts; as is the case with the fibres, the delicate membranes, the nerves and many other things. It is also known that by degrees they derive a hardness, and, because this most subtile [element] is enclosed everywhere, that they gradually take on the human form; wherefore, if the feeble, tender, and easily moved parts, are agitated meanwhile by perpetual and daily motions, the delicate structure itself, moved for a long time in this way, and always being formed and equalized in its growth and expansion, is rendered most obedient and yielding. On the other hand it follows that, if the animal mature more quickly, and if the parts be applied to each other sooner, before they grow accustomed to the motions, they become rigid, and derive a callousness as it were, whence it happens that the more subtile parts, and those nearer to these simples, pass with difficulty by their motions into what is posterior, and no way lies open through those parts, or through the organs proximate to the most simple [degree], except a confused one, as it were through dense tunics. In the degree, therefore, that the animal continues longer in reaching its maturity, and in the extension (*tensione*) which is continually increasing, in that degree a more open and easy way may be formed and prepared to the most subtile degrees; and the animal is more perfect if only the means be supposed which are capable of perfecting it, which means perpetually subsist by the education of the subministering organs, by use, cultivation and motion. But perchance it may be objected, that man seems to draw out,—as is were, by the eyes of his spirit—many things to which he would not be able to give any aid by cultivation, either by means of teachers or by means of the external organic senses; also, that at this day many things are disclosed by the mediating thought alone, and thus seem to be derived into the corporeal organs immediately from this source; but, I desire to know what? and whether you think that many things are deduced analogically which lead to the reasons of effects? Now, I pray, what thought of analogy would a man have, who had not been instructed by any master? would it be better than that of a bird? Whence is that ratio, that one thing is to another as this is to a third, as also many others? whence is it, if teachers and educators have not trans-

mitted it to us, and if it has not been transmitted to them by others, and to these in the first place by experience? Afterwards this rule can be made use of to form conclusions in divers ways, but the rule itself is the offspring of experience, and its application lies in those things to which experience consents. In the degree, therefore, that man abounds in the store of experience, in the degree of the perfection of its disposition and distribution, in the degree that there is a more exact harmony and a more apt figure in the mediating organs, and that there is a more exalted way opening to the most subtile parts through a series and uninterrupted course, in that degree man becomes wiser; but he does not become divine. What is our wisdom? It is such as is the finite to the infinite; it is, therefore, in respect to the wisdom of the Infinite, nothing.

2. *A General Comparison of the Ontology and Cosmology of Christian Wolff with our Principles of natural things.*

I desire to make a comparison of our principles with metaphysical rules; whence it will be possible to judge, to some extent, upon what foundations our philosophy and theory rest, whether upon those which are geometrically and metaphysically true or not; this cannot be deduced from any better sources than the rules and axioms in the *Cosmology* of a man so learned as Christian Wolff, of whom it may be said, that he is truly a philosopher, and that he has exhausted the true principles of philosophy by constant examination, scrutiny and cultivation; also, that he has taught them metaphysically and according to rule (*regularissime*), and scientifically as well as experimentally; we may therefore see whether there is agreement or any disagreement. He treats of the mode of philosophizing in rational philosophy exceedingly well. *Complete freedom* (*libertas*) of philosophizing, he says, *must be vouchsafed to those who philosophize in a philosophical manner, and no danger is to be feared from this, either to religion, to virtue or to the state; again, without the freedom of philosophizing, there is no progress in science; likewise, in philosophy a place is to be ceded to philosophical hypotheses, so far as they prepare the way leading to evident truth; finally, if any one philosophizes in*

a philosophical manner, he has no need to fall into discordant opinions.

3. Definition of the Natural Point.

This natural point is not dissimilar to the point of the mathematicians, or the Zenonic point, for it furnishes an origin to the composite particles or entia of natural things, or to our elementary particles. This point by fluxion gives rise to lines, areas and geometrical bodies of every kind. If we must define it,¹ this point is natural; it is purely motion, or [arises] by means of infinite motion;² nothing can be conceived of as being in it which is in a composite, nor can anything be assigned to it by way of definition such as is assigned to a composite, except that it is its verimost simple, its *merum, purum et primum*;³ however, because the first offspring of the infinite is treated of, negative expressions are necessarily required; affirmative ones, adapted to common usage and to geometrical nature, being inconsistent with the definition which must be formed of it. We thus seem to play with words, since we lack those which are adequate to the expression of infinite things. Nevertheless there is in this point a certain analogy of those modes which exist in finite things, by means of which it is possible to conceive imaginatively of some of its attributes; still it is not possible to

¹Annotation:—Definition: it is the first natural ens, existing from the infinite by means of motion, and it is thus the medium between the infinite and the finite.

²The following, which Swedenborg wrote first, was afterwards crossed out by him and supplied by, "it is purely motion, or arises by means of infinite motion:"—"it was produced immediately from the infinite; it is the offspring of infinite nature; it is the first ens and seed of finite things; it thus exists as the medium between the infinite and the finite; it is a simple or most simple ens, in no way composited, finited or limited, unless it may be said to possess only one boundary and limit, for what is finite possesses two; it is infinitely small; in respect to what is finite it is nothing, or merely something imaginary; it is therefore devoid of magnitude, it lacks parts, it is not extended, nor are there aggregates of it without motion; it is indivisible, presents no figure, and fills no space."—Tr.

³Originally the following continued here, but was afterwards stricken out:—"for this point is a simple ens; its figure is merely or simply figure; its motion is merely or simply motion; it is the last to which finites refer themselves; so that it is the one boundary and first limit of finite things."—Tr.

grasp its analogies; it is the last, in which analogies cease, and where analogies cease there is the infinitely least; and there is no ratio between the finite and the infinite; no similitude can be formed by means of our reasons and notions; but lest the imagination should be deprived of a definition, some analogy must be employed (*subtribuendum est*).

4. Continuation concerning the Attributes of the Point.

It is asked, whether it can be established according to any philosophical reasoning, that the point is the medium between the finite and the infinite, or that there is a first and most simple ens produced by the infinite, and producing the finite, and which can be said to participate of each in this manner? We say that there is such a point, although in these words we seem to jest. I have said that it can be understood by analogy, that there is in this point motion, a figure of motion, and consequently figure, also place and consequently space; but it is according to analogy, imaginary and hypothetical, and is not a motion such as exists in composite, finite and geometrical things. But that there is a simple infinite motion which is purely motion, thus also a figure of motion which to our conception and in respect to finite motion is geometrically nothing both as to quantity and as to quality, follows from the necessary connection of principles; the reason is, that the finite necessarily derives its origin from the infinite, finite motion from infinite motion, what is extended from what is not extended, limited figure from unlimited figure, finite space from what is infinitely small, and what is infinitely small from the infinite, thus the finite world from the Divinity.

Since it is not possible to reason anything concerning the infinite, which answers to it, except such things as may be attributed to it by eminence, and which are able to stand such an application, for the reason that they cannot be said to oppose the infinite, but which, notwithstanding, cannot properly be attributed to it; therefore, it must assuredly be established, by means of the series, that there is a medium between the finite and the infinite, which strictly speaking, can be said to be neither finite nor infinite, but rather a simple; for there cannot be said to be any ratio between this and the infinite and the

finite. I say that it is necessary, before we proceed to the principles of finite things, to establish a simple, for the finite constantly refers itself to this, and this simple to the infinite. In this manner, therefore, it is permissible to demonstrate, how composite, geometrical, and finite motion may be conceived of, if only a least or smallest motion be conceived of, from which it begins; also, how the least or smallest, which can have no sensible ratio with the composite and finite on account of its smallness, if only pure motion, simple motion, which can be said to be nothing but motion be first conceived of; how composite, limited or finite geometrical figure, if only in this we again go back in imagination and first conceive of figure in the smallest boundaries, smaller than which there are not; and finally it will be possible to demonstrate, how these leasts may be conceived of, if only simple figure, pure figure, which is nothing but figure, be conceived of. This we say is the medium between the infinite and the finite, this is our natural or mathematical point.

We philosophize therefore in this manner: whence is geometrical and composite motion and figure, unless it be from simple and pure motion and figure? whence this, unless it be from what is less composited? whence is motion and figure less composited, unless it be from the least? whence is this least, unless it be from simple and pure motion and figure? whence this, which is simple and pure, unless it be from what is infinite? whence the infinite unless from itself? and what is the infinite from itself, unless it be God and the Divinity, the origin and ens of all things?

5. *Concerning the Motion and Figure of Motion of This Point.*

Since we have said that this point arises from the infinite, and that it is thus a simple ens and the first seed of finite things, also that it is by eminence a something which exists, because it is produced by the infinite and as it were produces the finite, we may now reason how, in an eminent sense, such a point may be said to exist. We ought to present some sort of idea of its origin and production, not geometrically, but analogically, and by similitude with finite things, otherwise no idea of its existence can

be presented. If the point exists from the infinite, it cannot exist otherwise than by means of motion; motion is the only means of its existence, no other means can be conceived of; so that the point is nothing but motion, simple and infinite motion, and simple and infinite motion is nothing but the point; no origin [for the point] can be found elsewhere. Analogically we may argue, that something is able to exist by means of motion, which otherwise without motion does not exist; likewise, that motion may represent a certain ens very different from itself, and that it is able to figure something which is, as it were, new and very dissimilar to itself. Let us imagine a small corpuscle, or an aggregation of small parts moved very swiftly, either spirally or otherwise, by means of this motion, a figure or a form different from the former is at once represented; by a very swift motion reciprocally from one end to the other, a line is represented; by the fluxion of the line sidewise, the likeness of an area is produced; and by the fluxion of the area a body is effigied; although there is really only a corpuscle, a line or an area, which flows swiftly and reciprocally. So also, if the same corpuscle flowed circularly, with a very swift motion around a centre, a circle might be represented; if a semi-circular line revolved around an axis, the likeness of an entire surface might be produced, and so forth, as is sufficiently well known. A corpuscle in this manner is able, with the necessary celerity and direction, to present figure, or something which did not exist before, and which may be very different from the fluent corpuscle itself, and which likewise may, to our senses and contact, be figure; when nevertheless it is merely (*pure*) motion which effects it, or it is a figure effigied by means of motion. Let us return to the point which proceeds immediately from the infinite. In what other way can this be conceived of as existing, than by a mediating motion, by infinite motion, by most perfect motion, which is the same as this point? But I speak analogically.

Secondly, it is asked, what is the nature of the motion which is infinite and therefore most perfect, by whose mediation such a point could have arisen from the infinite? Again we must speak analogically, lest the imagination be wanting in some idea of it. Suppose, therefore, this motion produced from the infi-

nite; then, because it is produced from the infinite, it will also be infinite; if it be infinite it will be most perfect; if most perfect, according to the idea of finite things, its figure will be most perfectly circular. What is motion most perfectly circular, if not altogether, in every sense, and in every dimension, circular, that is infinitely circular? What is motion in every dimension and infinitely circular, if not the most perfectly spiral? What is the most perfectly spiral, if not altogether, in every sense, and in every dimension, also infinitely spiral? What is in every dimension and infinitely spiral, if not this point? But because the motion is simple, infinite and most perfect, it seems inconsistent that the figure of the motion be so determined, as to say that it is spiral; for that expression involves something of composite, finite and geometrical figure, space and motion; but add, that the motion is infinite, most perfect, and the most perfectly spiral, (there are also other infinite and most perfect attributes), then it follows that it has not the figure of a finite sphere, which extends from a centre to a periphery, and *vice versa*; here no centre and periphery can be conceived of geometrically, and there is no space into which it runs; therefore in the definition of the figure of this motion, paradoxical expressions must likewise be used; as for example, that the motion is not from a centre to a periphery, or reciprocally, but from centres to peripheries, and from peripheries to centres; that there are infinite centres and infinite peripheries; that where the centre is, there the periphery is, and the reverse; that the motion is in an instant in the centres and in the peripheries, or is everywhere, so that the centre and the periphery are here one and the same thing.* But perchance you will wonder, reader, that I use expressions of this kind, which depart in such a paradoxical manner from the idea of finite things, and which are foreign and contrary to the common notion, in order to present an idea of infinite vortical motion or of the form of the motion in this point or simple ens, when by means of such explanations I seem to elude our senses. But remove the idea of what is finite, conceive of mo-

*And that thus the motion cannot be called either intrinsic or external, unless it be understood most simply; that it is not change of situation (*situs*).

tion infinitely perfect, imagine that there is an infinite, and at the same time that there is pure motion, that its figure is purely figure; imagine that there is place infinitely small, and many other things, which we must needs present imaginatively before we can arrive at the origin of finites. In what manner can the subject be presented so that the expressions will not depart from the common notion and from the laws of finite things? I will be able to present a better idea of the first and second particles, which arose from the spiral or vorticle motion of the points, the points flowing continually from the centre to the peripheries, and from the peripheries to the center; for there is an infinitely swift motion, it is in the periphery in the same instant that it is in the centre, and *vice versa*.

6. Geometrically concerning the Point.

Since, therefore, this point is not finite, does not possess both limits, is simple, a pure and mere something, the first limit and boundary of finites, it cannot for this reason lay claim to much of a place for itself in geometry; geometry concerns itself with finite things, and treats of their boundaries and limits only, or of the variations and modes of limits; nevertheless geometry does have a place here, in this, namely, that it sees here its beginning, its origin and conception, the egg and seed of its existence; it sees also its one limit formed by means of pure motion from the infinite, and next its other limit,—at first very small notwithstanding,—formed also by the mediating motion and by the fluxion of the same points. Still geometry is not able to form any demonstrations here, for it does not as yet acknowledge itself finited, nor hatched out, nor in its infancy, nor yet anything. We speak geometrically, however, in this: that geometry acknowledges the point as its beginning, that the point is called mathematical and Zenonic, that geometry acknowledges in it nothing finite, and that in respect to finite quantities and qualities it is equal to nothing; besides many other things, which we have defined according to the same rules; geometry does, therefore, seem to have somewhat of a place here, but it desires to be followed in the imagination rather than to be demonstrated.

7. *Metaphysically concerning the Point.*

Since, therefore, such a point is not capable of receiving any geometrical demonstration of itself, we must have recourse to metaphysics, principles, and axioms, and in place of a point substitute an ens, and so by means of the attributes of an ens proceed to its investigation. If we consider the attributes of a simple ens, it is such that it enjoys only one limit; it is not limited or finited but unlimited or unfinited; it is that from which composite and limited things proceed; it is that which cannot be geometrically resolved; it is that which cannot proceed beyond metaphysics. Still, if such an ens is said to be produced from the infinite, and to be pure motion of the infinite and itself infinite, in this way geometry also approaches and seems to desire to assign to it a certain existence and figure, by means of motion; both sciences therefore have their place in the investigation of this ens; it acknowledges both at the same time, since in the point there is something, which is such, that from it, but by means of motion, finites may proceed; or it is such, that finites must be finally resolved into it.

8. *How the Succeeding Divisions are to be formed.*

Let us now proceed to things which are geometrical; first, to particles which are exceedingly and indefinitely small, afterwards, to those which are finited and geometrical, and through a connected series, to those, a volume of which constitutes an element in which we have experimental and ocular proofs of their existence, fluxion, and figure. But it is especially necessary that we proceed in order, as well, generally, in respect to the series of the particles themselves, as also, particularly, in respect to the origin, motion, and figure of each particle.

In order that a distinct idea may be had of each particle in particular, and of all in general, I desire to present in the *first* division concerning each particle, a definition of the particle itself, afterwards such descriptions of its motion, figure and remaining attributes, as may seem to lead to a better understanding and illustration of the definition; and at the end of this first division something concerning the cause and origin

of such a particle. In the *second* division concerning each particle, it is desirable to present its geometry, that is, whether that which I had endeavored to set forth is geometrically true; likewise, in how far the attributes of the particle are in accord with the axioms supplied by metaphysics. In the *third* division it ought to be sufficient to show in what manner the same things are experimentally and physically true, or, how geometrical things square with physical, principles with experiments, prior and antecedent things with posterior and consequent things; in this way what is theoretical may be confirmed by means of what is practical. In the *fourth* division of each paragraph, or of each particle, it must be made evident, whether there is a connection of principles, from the first origin, to that particle which I had treated of in the paragraph; for if there is not a connection from one end to the other, if there is no mutual relation of all the parts, no continual, perpetual and thus extended (*tensum*) thread of the principles from end to end, so that what is touched at one extreme is as it were touched at the other, or, if, according to the attributes of the means, there is no logical sequence which also squares with reason, then, the principles can by no means be said to be conformable to nature and to the world, for if the thread of the principles be broken, there will be as many principles and origins as there are breaks, or as many chimeras and dreams as there are principles.

9. *Definition of the First Particle.*

The first particle is a simple finite ens; it is the least that is geometrical; it is limited, but limited by the smallest boundaries; there is motion in it, which is an internal motion of the greatest swiftness, no swifter motion being possible; there is a least space which that motion fills, a lesser space not being possible; consequently, there is in it a least figure, no smaller one being possible. To sum up, the motion of the point is indefinitely swift, the figure is indefinitely small, and the figure of the motion is the most perfect and perfectly similar in all; it is an indefinite something, and unassignable in respect to quantities much finited and composited; it is the medium be-

tween the point and finites, between simples and composites; it is produced or has arisen from points, or rather from their fluxion into a most perfect figure, or into an indefinitely multiplied spire, flowing with an indefinite celerity from the centre to the periphery and reciprocally. It is the first substantial, there being nothing substantial in the world besides this finite. No composite substantial can exist except by means of motion, nor can it by any means arise except by the modification of something more simple. Motion did not appear before the substantial, but [only commences by means of it].*

10. *Concerning the Active of indefinite celerity arising from the Point.*

I confess that I have intentionally omitted a description of the first active ens, arising from the point in the same manner as the third particle, active, arose from the first, passive, or the fourth from the second. For if something arose from the point in the same manner, it would flow with an indefinite celerity, and by means of a motion of indefinite celerity, it would form and simulate a surface; it would exist as a something acting in the most perfect manner; we would have presented to us the first pair of simple entia, or the point and its active, similar to the second pair of the particles of the first and third kinds. I say that I have omitted this purposely because the description of such an ens, which can scarcely be defined geometrically, and an idea of which needs to be formed purely metaphysically by means of axioms, is contrary to our notions. And I have thought it unnecessary to multiply such entia when we ought to proceed to the series of finites and to our finite elements and their particles; meanwhile no notion can be had of it except by analogy and similitude with finites, both of the third and fourth kinds; just as no better idea can be had of the point, than by analogy and similitude with the first and second finite entia. Still I do not dare to deny, that an ens in the highest degree active could have existed from the point, in the same manner, and with a similar quality, as the third par-

*The MS. is obscure and the words uncertain.—Tr.

ticle existing from the first, or as the fourth existing from the second; but to express its action would, as said before, be merely to play with words.

II. *Concerning the Order of the Particles.*

1. The *First* from the spiral motion of the entities. 2. The *Second* from the spiral motion of the first particles. 3. The *Third* from the second motion of the first particle. 4. The *Fourth* from the second motion of the second particle. 5. The *Fifth*, the first elementary particle, the smallest, and magnetic; also the manner of its compression. 6. *Sixth*, its globe by means of compression [of the fifth or first elementary particle]. 7. The *Seventh*, the second elementary particle or the truly magnetic, and concerning its state of expansion and compression. From the fourth tome of [my] principles are to be adduced those things which treated of vortical motion, the first obscuration of the sun, and of the sundering of its crust.

12. *That Nature is similar to a Spider's Web.*

Nature is not unlike a spider's web, and natural philosophy is not unlike the spider herself; she builds her web in places where it is possible to fasten her threads on all sides, and to draw them together into a centre; the radii which she then forms she makes to meet in a centre, and she ties and binds them together at various distances by circles or polygons, so that she may have a contiguous connection, by means of intermediate threads, throughout the whole sphere which she occupies; she however betakes herself back to the middle or to the centre, and so applies her feet to the threads or radii, as to be able to perceive if the least particle touches any radius, at any distance. In this way therefore she prepares herself to entrap flies and other insects; if anything falls upon the threads or snare, she, lying in ambush as it were in the middle, knows immediately, where and in what part of her web it fell, for she rushes out instantly by that very radius and no other, and seizes upon her entangled victim. Nature herself therefore closely resembles this spider's web, for she consists, as it were, of infinite radii proceeding from a certain centre, and of infinite circles

and polygons, so that nothing can happen in one of them, which does not immediately refer itself to the centre, and which is not dispersed from thence through a great part of the web. By means of such a contiguity and connection nature is able to sport in her operations, and in this consists her very essence; for where her contiguity ceases, or her connection with the centre and with the rest of the peripheries, there nature herself ceases. Natural philosophy is capable of taking its station with nature, near to this centre, to which all natural things refer themselves, or in which all the motions of the peripheries are concentrated; it is able to perceive and to know, immediately, everything which occurs in the peripheries, what it is, and whence it comes; and is able to render back to nature the reason why the phenomena must needs occur successively, and from a certain physical necessity, at such a distance, in such a manner, and in no other; in a word, natural philosophy from the centre, is able to view simultaneously those infinite peripheries, or to measure her whole world at a single glance; she does not, as has been supposed, stick to the outmost peripheries, and like the fly, by means of much labor and effort entangle herself more and more in the web, and become the prey and sport of her own wisdom and philosophy.

SWEDENBORG AND KANT ON THE NEBULAR HYPOTHESIS.

The inquiry has often been made as to whether Kant received the fundamental idea of his Theory of the Heavens from Swedenborg's *Principia*. It has been impossible as yet to find out whether Kant ever saw the original of the *Principia*, but it has been suggested that the idea may have been transmitted to him through a review of that work which was published at Leipzig in the August number of the *Acta Eruditorum* for the year 1737. In order to settle this phase of the question, I have made a translation of the review in question and herewith append as much of it as treats of part three of the *Principia* in which the formation of the Solar System is explained.

“The third part of the *Principia* places before our eyes, 1. A comparison of the star-studded heavens with the magnetic sphere, p. 373; 2. The diversity of worlds, pp. 381-5; 3. An inquiry into the fourth finite and its origin from the second elementary particle; 4. Concerning the universal chaos of the sun and planets, and its separation into planets and satellites, pp. 387-96; 5. On the æther or third elementary of the world, pp. 397-411; 6. Concerning the fifth finite, p. 412; 7. Concerning the air, or fourth elementary of the world, pp. 413-17; 8. On fire, or the actives of the fourth, fifth, and following finites, pp. 418-28; 9. Concerning water, or the purely material finite, pp. 429-432; 10. On water vapor, or the fifth elementary of the world, p. 433-37; 11. On the vortex about the earth and the progression of the earth from the sun to the circle of its orbit, pp. 438-444; 12. On the paradise of earth and the first man, pp. 445-9.

We select for our purpose a very few of the facts that are more easy of understanding than the rest. Our author says, p. 379, that our solar vortex is not in the axis of the sphere, but near the axis where there is a marked curvature or flexure. Again, that the common axis of the sphere or star-studded heavens, is the Milky Way, where there is the greatest swarm of stars; that along the Milky Way all vortices cohere at their poles in rectilinear arrangement and series and are more closely bound together. The other solar or stellar vortices stretch then further from the axis and are variously bent, yet all have reference to the axis. And on page 380, he says, that there are innumerable such spheres or star-studded heavens in the finite universe, and that they can be linked together just as the spheres of two magnets can, and that the whole visible heaven is perhaps but a point in the total universe. The fifth finite (see p. 412), exactly similar to the preceding, he describes as having its origin where there is a supply of finites of the fourth class, where also the fourth finites can spread around on all sides and set bounds to a world. Hence they arise near the surface of the earth at some distance from the sun, where there is not so great a pressure of the vortical element as there is near the sun. On page 413, he says, that air consists of fourth finites on the sur-

face and within holds enclosed first and second elementaries, and is thus very similar to æther, differing only in degree and dimensions.

On page 419 he tries to prove that the active of the fourth finite generates a subtile elementary fire, while the active of the fifth, or the fifth finite made active, generates our common atmospheric fire. A particle of water, he says on page 429, is very like a compressed air particle in which there is nothing elementary, yielding, or elastic left. It is hard, and consists of tiny spheres in contact with one another, forming together a greater one. This water particle is not the same kind of a finite as any of the preceding ones which can actuate themselves, but it is a purely material finite; consequently water is not an elementary particle, etc.

Concerning vapors, he teaches, page 434, that they are formed on the surface of waters by a motion of the interfluent æther particles, and that the vapor, when formed, includes within it a tiny volume of æther, and outside is pressed by æther as well as by air. Thus its surface is held in equilibrium by the forces acting outside and inside it, and hence preserves its spherical form in every degree of compression, etc.

The earth has passed through innumerable changes before reaching its present condition, according to our author's mind. For when it first began to withdraw from the sun, it rotated about its axis and in its gyres more rapidly than later, when it had receded to an always greater distance from the sun. It thus passed through as many changes as it did circles or spires, or as there were different degrees in its velocity of both annual and daily revolution, it passed from the sun to the circle of its own orbit.

Therefore our author concludes that the earth, in that state when it was gyrating more rapidly about its own axis, and the sun, and was passing through shorter days and years, was rejoicing in a kind of perpetual spring, without which seeds could not have been born, nor vegetable and animal forms of all kinds been produced. That the earth had formerly shorter days and years he considers proved by the long life,—about eight or nine centuries,—of the first men. How the ante-

diluvian men would wonder if they should happen in on our times—so short a spring but so long an autumn and winter—how they would complain at the long years, and that they were growing old before their time! etc.

But we have not time, nor does our purpose require that we mention more of his ideas. It will therefore suffice to have given an outline of this system so that the reader may judge of it for himself. We have used the author's own words as much as possible. If nevertheless he finds some gaps or statements not entirely in accord with his own views, we hope that he will willingly grant favor to us when he considers that the first reading, and that a cursory one, of his philosophy will scarcely suffice for perceiving, much less for collecting in an epitome, all the subtilities with which it is replete."

It is wholly unnecessary to speak at further length to answer the question with which we began for it is perfectly evident to everyone that even Kant could not.

C. RIBORG MANN.

NOTES AND COMMENTS.

THE delay in the appearance of this number of the NEW PHILOSOPHY is unavoidable, on account of the transfer of the magazine to the Scientific Association at the beginning of the Summer vacation. It is hoped that the rich table of contents in this number will suggest to our subscribers the importance of immediately forwarding their membership fees and subscriptions to Mr. Carl Hj. Asplundh, Huntingdon Valley, Pa., Treasurer of the Association. Without prompt remittances it will be impossible for the Association to fulfill its ideals of a useful quarterly promptly issued.

WITH the present issue we have the pleasure to begin an instalment of Part IV. of Swedenborg's work the *Animal Kingdom*. This part, which is entitled "On the Senses" is now for the first time translated into English, by Prof. E. S. Price. We regret that lack of space this month requires the instalment to be so small.

THE first translation of Swedenborg's Notes to the *Principia*, made by Rev. Reginald Brown, and also appearing in this issue, will be found of great interest.

AMONG scientific articles appearing in our New Church contem-

poraries we beg to call attention to Gilbert Hawkes's article "The Hypothesis of Evolution in the Light of the New Church," published in *The New Church Review*, and to Rev. J. E. Bowers's article "Swedenborg the Christian Philosopher" in *New Church Life*, November issue.

WE beg to call attention to Miss Beekman's studies on "Spectrum Analysis and Swedenborg's 'Principia,'" advertised on the back cover of this issue.

The report of the Purposes, Scope and Accomplished work of the Swedenborg Scientific Association, sent to the General Convention of the New Jerusalem, the General Church of the New Jerusalem and the English General Conference, was received by each with resolutions testifying interest in the work and recognition of the important uses of the Association. The following communication from the President of the English Conference will be of interest:

Dear Brother—As President of the General Conference, I have to acknowledge with great pleasure your communication and Report *re* the work of the Swedenborg Scientific Association.

There is a deep and growing interest with many of our friends here, in the presentation to the world of any material relating to the scientific works of Swedenborg, and we rejoice heartily that your Association promises to be so successful in the accomplishment of the objects it seeks to further.

Believe me, with good wishes,

Fraternally yours,

J. T. FREETH, President.

IN ATOMIC PHILOSOPHY some very radical changes have been going on during the last two years. Ever since men have reasoned concerning the ultimate nature of matter the idea that there is but one form of primary matter has taken a leading place. But although all theories in this domain of speculation have postulated a primordial atom, though men of science have repeatedly attempted to determine what properties such an atom must possess, yet no one has been able to bring particles smaller than chemical atoms into the domain of experiment until within the last year. Science has looked to chemistry to find methods of penetrating into the secrets of atomic structure; but though the chemist has been able to make much progress towards a discovery of the nature of the arrangement of atoms in molecules, he has not been able to make even the slightest impression on the atoms themselves. This resolution of atoms into smaller particles called corpuscles or electrons has been the work of physicists. The discovery has been made by a consideration of the relations existing between masses and the electric charges which they carry as exhibited in electrolysis, in the cathode rays, and in the action of magnetism on light on what is known as the Zeeman effect. These three different phenomena all lead to the same conclusion, namely, that the masses with which we have to deal in these three cases must be no longer than the thousandth part of a hydrogen atom—which the

chemists conceive to be the smallest of all atoms. In other words, physics now holds the hydrogen atom to be made up of about a thousand corpuscles, and claims to have brought these corpuscles within the reach of experiment. Those who wish to study the matter more closely will find the most important papers on the subject those by J. J. Thomson in the *London Philosophical Magazine* during the past year—especially the one in that journal for December, 1899.

It is perhaps needless to call attention to the immense tract of unexplored country which opens up before men of science because of this discovery. Science has worked a century or more determining the properties of the chemical atoms. Is it rash to predict that the scientific activity of the century soon to begin will be directed towards a determination of the properties of corpuscles and their methods of uniting to form atoms?

C. RIBORG MANN.

“DREAMS OF A SPIRIT SEER, ILLUSTRATED BY DREAMS OF METAPHYSICS,” by Immanuel Kant, Translated by Emanuel F. Gœrwitz, and Edited, with an Introduction and notes, by Frank Sewall, London; Swan, Sonnenschein & Co., Limited, New York; The MacMillan Co., has been received. This constitutes No. 13 of “The Philosophy at Home” Series, and is a remarkable work. It deals with a crucial question; namely, In our philosophy shall we be content with primary evidence? Shall we believe anything the data for which cannot be found in our own consciousness? Kant emphatically says, No! He explored the soul, mapped out its confines, surveyed its surface, and described its contents; but beyond this he refused to go. Our ideas of a spiritual world above us, and of an external world below us, are certain; but from those *ideas* there is no bridge to the things themselves. The mind has no means of verifying nor of disproving Swedenborg’s disclosures of the spiritual world. Therefore we can neither affirm nor deny them; better let them alone. Such is the doctrine of the book. At the same time the editor shows, both by facts and by striking quotations from German scholars, that Swedenborg’s doctrines had a strong influence on Kant. Some of the quotations show also that there is an effort in certain quarters to understand Swedenborg’s visions simply as disclosures of the soul’s higher subjective states. This work, showing the careful editing of a scholar, and brought out by leading publishing houses in London and New York, is well worthy the study of all, especially of those versed in philosophy.

REV. E. D. DANIELS.

THE NEW EDITION OF “THE SOUL.”

We are glad to welcome the new edition of Swedenborg’s *Rational Psychology*, which issues from the joint enterprise of the New Church Board of Publication, New York, and James Spiers, London.

It appears in a neat dress and in all the mechanical features of the bookmaker’s art it is highly attractive.

The editor adds, in this new edition, some interesting matter in the way of an introduction, which seems to characterize the position of the treatise both in Swedenborg's own system and in the larger field of its historical relations. A feature of peculiar interest in this introduction is the discussion of the relation between the scientific and the philosophical works of Swedenborg, and the application of the doctrine of correspondence to this relation, according to which these two bodies of doctrine are independent of each other, and yet by virtue of the universal fact of correspondence they stand, as truth on their respective planes, in natural and necessary agreement.

This is not the occasion to discuss the book as a body of psychological doctrine, but a word may be said as to its peculiar merits. We must, in the first place, be careful to observe the important historical but by no means absolute distinction between Rational and Empirical Psychology. Granting that the two are never in fact entirely separated, there have nevertheless developed in the course of history two tendencies which lead to two quite different methods. Rational Psychology would find its completion in a systematic treatment of psychological concepts; Empirical Psychology, on the other hand, tries to keep to the method of direct self-observation, this is, attentive and intelligent study of the actual and *concrete* states of consciousness as they presently and momentarily take place. But, as is obvious, Empirical Psychology must find its completion in a systematic description of the whole body of conscious facts; and such a description would be Rational Psychology under another name.

Swedenborg's book is, in its characteristic excellence, a pre-eminent specimen of Rational Psychology, but it is a Rational Psychology resting upon a broad and thorough psycho-physical basis. Indeed, this aspect of the work suggests that it would be a highly important and interesting investigation to determine to what extent and in what sense Swedenborg merits the distinction of being one of the first and greatest physiological psychologists. The modern psychology of parallelism would find here in Swedenborg's work, of more than one hundred years ago, an interpretation and a doctrine which would extend its views and interest to considerations very much deeper and wider than its present ones.

In the field of Rational Psychology, Swedenborg has, again, for the modern psychologist, a like suggestiveness and enlightenment. Aside from its application to psycho-physics, his doctrine of correspondence, in application to the higher and lower mental faculties, is a wonderful piece of constructive mental philosophy which would inspire and enlighten any one who would take the pains to master it.

Another distinctive merit of the book is its treatment of the affections, the emotional and voluntary functions of the Soul. It is here that Swedenborg is characteristically pre-eminent; for it is here where he comes nearest to the core of his subsequent illuminated teachings as to

the nature of spirit and to his central and supreme doctrine of Love. It is here, too, where Swedenborg's mastery in the field of Empirical Psychology is conspicuous and where he most shines in comparison with modern psychologists.

As to the whole book, it is a monument of psychological doctrine, much of which remains to be interpreted and worked out by means of and in connection with the latest results of modern study.

We shall look with interest to the impression the book will make upon readers in Scientific and Philosophical Circles, but we wish especially to commend it to the thoughtful study of our own people as a preparation and a means to the correct understanding of that unique and superlatively important body of "spiritual" Psychology contained in the *Arcana Cœlestia*.

It would be well before reading it, however, to make one's self quite familiar with the books of James, Stout, and Baldwin.

LEWIS F. HITE.

NOTE BY THE TRANSLATOR OF SWEDENBORG'S NOTES
RELATING TO THE LARGER PRINCIPIA.

THE translation, appearing in this issue is the first one, that has been made of Swedenborg's *Notes to the Principia*. It has been made from the Photo-lithographed Copy of the Original Latin Manuscript as contained in Vol. III, pp. 83 to 90.

These "Notes," or first drafts as some of them appear to be, were originally scattered through pp. 40, 41, 47, 49 to 55, 57, 58, 86 and 88 of *Swedenborg's Common Place Book*, and without doubt they belong properly to his *Journal of Travel* for the year 1733, being written at various times between July 15th and August 16th of that year. They have been extracted by Dr. R. L. Tafel and photo-lithographed consecutively in the order in which we have translated them, with but two slight exceptions.

The following are the dates upon which the various sections were written: Sections 1 and 2, some time between July 15th and 20th, with the exception of part of Section 1 (line 3-28, p. 2), which was written between July 30th and August 6th, with a note indicating where it was to be inserted; Section 3, between July 20th and 23d; Sections 4 to 10, between July 23d and 25th; Sec. (11) about July 28; Sec. (12) between August 13 and 16.

The reasons for our fixing the date so definitely will be seen by comparing the Photo-lithographed MS. of these "Notes" and of the *Journal of Travel* for 1733, together with Dr. Tafel's references to the paging of the *Common Place Book*. Evidently Dr. Tafel did not consider that the notes constituted in any way part of Swedenborg's *Journal*; he has therefore indicated that they were written some time between 1724 and 1733. (See Tafel's *Documents*, Vol. II, p. 907, also p. 872.) The evidence

seems complete, however, that they were written at the same time as the items of the *Journal*. As further confirmation, and as suggesting the historical importance of fixing the date, it will only be necessary to call attention to a note made by Swedenborg in Dresden on July 10th, 1733:

"At the house of Secretary Rûger, I saw Wolff's *Cosmologia Generalis*; he endeavors to establish the nature of the elements from merely metaphysical principles; his theory is based on sound foundations." (*Documents*, Vol. II, p. 29.)

Compare with this what Swedenborg says of Wolff in the Appendix to the *Principia*, where he intimates a certain indebtedness to Wolff, in the revision of the *Principia*, and where he speaks of having formulated and written out his principles two years before he had seen Wolff's works.

If Swedenborg had not seen the *Cosmologia Generalis* before July 10th, 1733, he could not have written Section 2 of these Notes before that date. It is probable, therefore, as Swedenborg was at this time revising and correcting his *Principia* in preparation for the press, that he received some new suggestions and confirmations from Wolff, especially in regard to the more metaphysical treatment involved in the *Point*, and that he rewrote the chapter on the First Natural Point. This being so, we may consider the larger portion of the Notes,—also on the Natural Point, a first draft of the Second Chapter of the *Principia*. (Compare *Documents*, Vol. II, 872.)

R. W. B.

SIR WILLIAM THOMSON'S THREE HYPOTHESES OF THE MAINTENANCE OF THE SUN'S ENERGY.*

Three conceivable sources of the maintenance of the sun's radiant energies are mentioned by Sir Wm. Thomson. (Baron Kelvin.)

The first hypothesis given is that the sun "was created a miraculous body, to shine on and give out heat forever" by the "Creative Power,"¹ like a clock-work moved by a weight miraculously created from the beginning never to run down.²

The second hypothesis is that the maintenance of the sun's light and heat energies are due to the heat generated by the abrupt impact and stoppage of a stream of meteors directed upon the surface of the sun, the energy of their momentum being thus suddenly converted into heat energy. This stream of meteors thus driven against the sun must consist of either (1) a certain quantity of meteors coming from extra-planetary space, or (2) "a double quantity in the same time from orbits inside that of Mercury,"³—the sun's annual "energy radiation," as a scientifically measured amount, being one of the factors of calculation.

The third hypothesis is that the sun is, at present, an incandescent, liquid mass, cooling; the concomitants of which process are (1) a radia-

**Popular Lectures and Addresses*, Vol. II. Nature Series, MacMillan & Co., 1894.

¹pp. 49, 45.

²p. 473.

³p. 128.

tion of light and heat energy equivalent to the present amount of solar light and heat, the whole process being exactly comparable to the known heat-radiation from cooling masses of matter once highly heated,—“as we must reason on the sun according to the properties of matter known to us here:”⁴—and (2) a shrinking of the mass of the sun.⁵

From 1854 Sir Wm. Thomson was for a number of years an ardent advocate of “the hypothesis that the energy continually emitted as light (or radiant heat) might be replenished constantly by meteors falling into the sun from year to year.”⁶

This meteoric hypothesis of the maintenance of the sun’s energy, he was led step by step to regard as no longer tenable. The reasons for his change of attitude were, first, that if estimates were based on the supposition which derived the requisite stream of meteors from extra-planetary sources, it was found that, in fact, “meteors falling from extra-planetary space in sufficient abundance to generate the heat emitted from the sun for the last 2,000 years, must, by the augmentation they must have brought to the central mass, have caused a gradual shortening of the year, of which the accumulated effect during that period must have dislocated the seasons to the extent of a month and a half. But observation proves that there has been a dislocation of the seasons only to the extent of an hour and three-quarters since a certain eclipse of the moon was seen on March 19th, 721 B. C. in Babylon. It is quite certain, therefore, that meteoric supply for sun heat has not within historical periods come from distant space outside the earth’s orbit.”⁷ The second supposition was, that the meteors might come from meteoric streams circulating near the sun’s surface, inside the orbit of Mercury; but the density of this cloud would have to be supposed so great that comets could scarcely have escaped, as comets actually have escaped, showing no discoverable effects of resistance, after having passed his surface within a distance equal to one-eighth of his radius.⁸

Thus, on purely astronomical grounds, Thomson says that he was at length obliged to abandon the meteoric theory, “but,” he adds, “now spectrum analysis gives proof finally conclusive against it.” For each meteor on approaching the sun by a spiral path must be converted into vapour by the enormous heating power of his near radiation, and thus, if the meteoric hypothesis were correct, “friction between vortices of meteoric vapours and the sun’s atmosphere must be the immediate cause of solar heat.” It is possible then to calculate the velocity with which the vapours circulating around the sun must move for their friction to generate yearly an amount of heat equal to the sun’s annual output. But, “the spectrum test of velocity, applied by Lockyer, showed but a twentieth part of this amount as the greatest observed velocity between different vapours in the sun’s atmosphere.”⁹

⁴p. 50.⁵p. 519.⁶p. 50.⁷p. 127⁸p. 187.⁹p. 188.

For these reasons Sir Wm. Thomson in the end definitely gave up, as untenable, the entire meteoric theory. With it he also gave up the possibility of any outside sources of maintenance. "If then," he says, "we are obliged to give up every source of supply from without,—and I say it advisedly, because * * * we see all around the sun, and we know that there is no other access of energy into the sun than meteors,"¹⁰ there remain in his thought but the first and third hypotheses.

The first hypothesis regards the sun as what he would choose to call a "miraculous body," the energetic activities of which directly refer themselves to, and are dependent upon, a "Creative Power" *which is not nature*. Now under this hypothesis there can be but two positions. Either the energetic activities were "miraculously imparted to the sun once for all at the time of its first formation by the "Creative Power,"—a position which appears to be the *only* one that Thomson can here conceive; or, the energetic activities of the sun are perpetually maintained by that "Creative Power" of God which first provided them,—which is the position of Swedenborg, under the law that "sustentation is perpetual creation," and that other law, that light and heat are uncreate,—that is, that light and heat "motions" are enumerated among the several active forces which cannot be created as essential properties of finite substance in itself considered, but may be perpetually imparted, by means of suitable media, from sources with which the "Creative Power" is perpetually in sustaining and animating touch.

The third hypothesis, that of Helmholtz, is that "the sun originally acquired his heat in being built up out of smaller masses falling together and generating heat by their collision, but that at present he is simply an incandescent mass cooling."¹¹ Under this theory, "the whole store of energy now in the sun, whether of actual heat or of potential energy * * * depending on the extent of future shrinkage which the sun is destined to experience, is essentially finite and there is much less of it than there was three thousand years ago."¹² "With further and further shrinking more and more heat is to be generated * * * It ought, however, to be added that this condensation can only follow from cooling,"¹³ and we are therefore "driven to the conclusion that the sun is losing energy."¹⁴

As between these two hypotheses, Sir Wm. Thomson declares for the latter, and "adopts unqualifiedly Helmholtz's theory that work done on the shrinking mass is the true source of the sun's heat as given out at present."¹⁵ This seems to cover the ground in his view, so that he enters into no discussion nor, indeed, makes further mention of, the alternate hypothesis.

Remembering his instance that "we must reason upon the sun as if it

¹⁰p. 51. ¹¹p. 129. ¹²p. 473. ¹³p. 185. ¹⁴p. 51. ¹⁵p. 519.

were some body having properties such as bodies we know have,"¹⁶ it is particularly interesting to add here Sir G. William Siemens' opinion on Helmholtz's theory, and on the adequacy of the cause, supposed in that theory, to produce the known effect if it be judged by the tested properties of bodies here. On this topic he is, perhaps, especially qualified to speak authoritatively, having been associated with great iron works, and being deeply occupied with the present subject, besides having had probably a better experimental opportunity to learn the range of the possible properties of incandescent masses cooling than any living scientist. He says, "Among the ingenious hypotheses intended to account for a continuance of solar heat is that of shrinkage or gradual reduction of the sun's volume suggested by Helmholtz. It may, however, be urged against this theory that the heat so produced would be liberated throughout his mass, and would have to be brought to the surface by conduction, aided perhaps by convection, but we know of no material of sufficient conductivity to transmit anything approaching the amount of heat lost by radiation."*

In addition, as to the *fact* of that shrinkage which is an indispensable accompaniment of the condition postulated by this theory, it may be worth while to recall that item relative to an estimated displacement of the seasons an hour and three-quarters, since 721 B. C.,—a displacement presumed to be dependent for its cause upon an augmentation of the sun's mass, not a shrinkage,—which item has been already quoted in this review upon Thomson's authority.

It would seem, therefore, that the first hypothesis is worthy of more affirmative rational consideration. It at least is the only hypothesis of the three which has not been pronounced by competent authorities inadequate to produce the effect.

It is to be noted, however, in considering this hypothesis, that Swedenborg's position would deny the term "miraculous" as connected with the subject. According to Swedenborg's statement the other end of the chain of natural cause and effect, the energy end, is always held by the living Creative Power; and this not at some endlessly remote beginning in far off prior time, but now, instantly, everywhere. And thus not as something extraneous and what Kelvin would call "miraculous," but in the normal working order of the universe.

LILLIAN BEEKMAN.

"ARTIFICIAL PARTHOGENESIS."

Many have been the attempts to explain in a satisfactory manner so-called "vital phenomena." The researches of several learned and indefatigable workers in this field have demonstrated that substances, formerly supposed to have been elaborated only under the auspices of "vital energy," may be reproduced in the laboratory by comparatively simple synthetic methods. This has proved a strong incentive to further

¹⁶p. 49.

*Scientific Works of Sir C. Wm. Siemens, London. Vol. II, p. 424.

and more extensive study and investigation, and has led to the more positive assertion by some, that as our knowledge increases, all vital processes will be shown to rest upon a purely chemico-physical basis. The firm belief of the older physiologists that *life*, emanating from a source Divine, is uncreate, inscrutable and far above this world of the senses, has been losing ground, especially of later years. Apropos of this are the experiments of Prof. Jacques Loeb, of the Chicago University, who claims to have demonstrated that, by increasing the density of sea water in which were placed the unfertilized eggs of certain sea urchins (*strongylocentrati*, etc.) and star fish (the *Asterias Forbesii*) thus causing a slight loss of watery constituent by exosmosis, the eggs will germinate (See *American Journal of Physiology*, Vol. IV, p. 178, etc.) He has also obtained normal larvæ from the unfertilized eggs of the red-blooded sea worm (*annelidæ*) and suggests that even higher forms may respond to similar treatment.

To the casual observer, it might appear that Dr. Loeb has touched very near to the goal so long sought after by the biologist. The addition of a little common salt, magnesium chloride or other saline substances has apparently been the means of causing these eggs of a virgin mother to develop, at least into the more rudimentary forms of the parent species, that is the plutei of the sea urchin, the larvæ of the annelid, etc., extraordinary precautions having been taken to exclude all possibility of the presence of the male element. By an ordinary physical operation, a living creature has apparently been brought into existence. Yet withal, the fundamental changes that have taken place are not accounted for. The subject of parthogenesis is not new. Langstroth describes experiments conducted in his own apiary as early as 1852, showing that it is of frequent occurrence among bees. It would seem to be contrary to a law inscribed upon all nature, yet as it has been found only among the lower forms of life it may be accounted for by the much mooted questions of spontaneous generation. Osmosis itself has never received a comprehensive explanation, and in the present instance, when the tiny egg-cell has given up its modicum of water into the surrounding medium, the fact that it at once begins to pass through the complicated stages of Karyokinesis, shows that some occult force is operative from within. Yes, the student of biology, even if he has banished from his mind the last vestige of any belief in the supernatural is, nevertheless, compelled to recognize an omnipresent power, an intangible something which actuates every living thing, and can be investigated only in its outward manifestations in organic matter. This is a question which confronts the student of Swedenborg from the very outset, and must receive his serious consideration. Is life of Divine origin, or is it one with the forces of this material world? Swedenborg devoutly held to the former view, and a candid consideration of his scientific and philosophical writings will show that, while affording a most wonderful conception of nature and natural forces, they also offer the only rational explanation of how these may be governed and directed from within by forces of a spiritual origin.

HARVEY FARRINGTON.

LETTER FROM THE TREASURER.

TO THE MEMBERS AND FRIENDS OF THE SWEDENBORG SCIENTIFIC ASSOCIATION.

At the Third annual meeting of the Association two very important steps were decided upon, namely reducing the annual membership-fee from two dollars to one dollar, and undertaking the publication of *The New Philosophy*. This latter decision at once involved the Association in an expense which, however, it was hoped would be covered by the subscriptions.

Soon afterwards the treasurer received bills for the publishing of January, April and July issue amounting to \$311.00.

Having only \$137.10 on hand, being the balance received from the former treasurer and the accumulation of membership-fees for two years, a circular letter was sent to all subscribers to *The New Philosophy*, who had not yet paid their subscription for the present year, asking for payment and also inviting them to join the Association.

As the circular failed to bring a general response a second letter was sent, and the treasurer is happy to report as a result of these two letters, the receipt of \$98.00 in membership-fees, and \$109.00 for subscriptions, including a few special contributions among which one for \$20.00 was greatly appreciated, also the addition of 51 new members, making the total membership at present 105.

The treasurer has now received therefore enough to cover the above-mentioned debts, but has no funds with which to meet the present and future issues of this journal.

There are still one hundred and forty-two persons receiving *The New Philosophy* who have not responded to the call for payment, but it is sincerely hoped they will do so soon, and that they at the same time will take the opportunity to join the Association.

For the sake of economy it has been necessary to change the place of publication, and hereafter it will be possible to publish each issue of the journal in its present size for about \$50.00.

If more funds were available, it would be desirable to increase the present size—32 pages.—but this would require a larger number of subscribers.

The treasurer takes occasion to invite subscribers and members to co-operate with us as far as possible. One way in which this may be done is to send him the addresses of such of their friends as they think may take an interest in the uses of the Association. These uses are:—

"I. The preservation, translation, publication and distribution of the Scientific and Philosophical works of Emanuel Swedenborg.

"II. The promotion of the principles taught in these works, having in view likewise their relation to the Science and Philosophy of the present day."

Yours sincerely,

Huntingdon Valley, Pa.

CARL HJ. ASPLUNDH, Treasurer.