

SWEDENBORG ON THE APPEARANCE AND DISAPPEARANCE OF NEW STARS.

THE story of the new star suddenly appearing in Perseus in February, 1901, is a late item of the continuous Wonder-Word of Creation, the rumor of which has aroused wide-spread interest even among our busily engrossed public. Not that the birth of a new star, or the rapid obscuration of one newly gleaming out, are rare occurrences in the shining annals of the sky. "Astronomy," Swedenborg says, "is richly furnished with phenomena of this kind;" and he quotes from David Gregory a list of new stars noted from the age of Hipparchus down to 1702.<sup>1</sup> Since which time a number of additional *novæ* have appeared. Again, in the *Worship and Love of God*, where Swedenborg is speaking of a formation of the primitive planetary- or magnetic ether in the immediate vicinage of the active solar area,—he mentions that such an occurrence is not infrequent in the heavens; and instances the occasional appearance of new stars at first shining with a "ruddy-gold effulgence" (*admodum rutilè effulentia*);<sup>2</sup> and presently obscured; to be restored again to splendor. The "obscuration" mentioned being incident to this formation of a dense mass of a primitive planetary-matter about every active solar area at a relatively early epoch after its first establishment; and the sudden restoration of splendor being due to the too great expansion and final breaking up of this encompassing planetary mass under the continued action of the centrifugal force of the whirling motion imparted to it by the axillary rotation of the new star or sun,—assisted by a certain pressure exerted upon it interiorly by the fiery and expansive energy of the central active-area inclosed. Such sudden disruption is followed by an outward-gyre of the planetary masses along a widening helix path as they lose

<sup>1</sup> *Principia*, Swedenborg. Pars III. Paragraphus iv. (7).

<sup>2</sup> *De Cultu et Amore Dei*. Caput I; section I, 9 (d).

the force of the first centrifugal impetus and are caught up by the large flow of that vast "vortex-ring" of the solar sphere (of magnetic ether) which forms an immense, permanent magnetic field about solar centers, revolving with their motion, and accompanying them as they move along their orbit. Borne by the large flow of this rotary solar-sphere, condensing as they go, and trailing their substance about them, the primordial planetary masses pass outward from the sun in easy gyres toward the place of their final equilibrium and orbit.<sup>3</sup> Thus, according to Swedenborg, there may arise "new heavens," and in the heavens new solar-vortices and systems with their planets; and in this manner, arise new creations in endless succession, at the nod of the Divine power (*si annuat numen*).<sup>4</sup> Elsewhere, as quoted, he instances by name and date several such actual occurrences. So manifestly abundant and present is the continual creative and formative power in the starry deep, and so wonderful its operation, that Swedenborg compares this sending forth of a new system, as it were a new star, to nothing less, for wonder and worth of interest, than the creation and first formation of a new human being,<sup>5</sup> all the miracles of which are directly attributable to the Divine Providence.<sup>6</sup>

This notable new star of February, 1901, the *Nova Persei*, is even not the first star appearing in the constellation Perseus, but the second. It is, however, the first *nova* of which a series of photographs has been obtained, permitting a comparison both of the phases of its rapidly changing and often alternating spectra, and of the successive positions of the several bright condensation centers occurring in the surrounding nebula; from which comparisons a certain trend of cosmic event was manifest, not only in the tremendous operations going on in the active area itself, and its immediate vicinage, but also as making rationally certain the existence of some structural and motive connection between the condensation-masses in the swirl of

<sup>3</sup> *Principia*. Pars III. Paragraphus i. (1-11), III., IV. (1-7), V., XI. (1-7).

<sup>4</sup> *Principia*. Pars III. Paragraphus II.

<sup>5</sup> *Regnum Animale*, Swedenborg. Pars VI. Section II: 41. Inductio.

<sup>6</sup> *Economy Animal Kingdom*, Swedenborg. Part I., 296.

*The Divine Wisdom (A. Ex.)*, Swedenborg: II.; [2], [4].

those far-off and swiftly fading nebulous-wisps and the new-born star, whereby they referred themselves to the active area of the *nova* as to the center of their own immense gyre.

That such an event should have aroused the interested speculation of the whole scientific world was inevitable. On both sides of the Atlantic, astronomers, physicists and chemists have been eagerly engaged on the various aspects of phenomena presented. The possibilities and inferences most pressingly suggested involve not only the direct astronomical interpretation of the phenomena and their bearing on questions of solar epoch *sub judice*, but they touch upon matters of solar physics in such wise as to renew questions as to the origin and maintenance of the great active areas constituting what we call solar centers; and reach to fundamental considerations as to the origin and mode of origin of ponderable "matter" as we know it, from the substance of the imponderable ether. For the impondering ether, being regarded as the sole primordial and all-present or pervading medium, presumably furnishes to matter itself its substratum or substance.

The facts concerning the new star in Perseus, briefly, are as follows:

It appeared February, 1901. In four days its brightness increased from invisibility until it became the brightest star in the northern sky,<sup>7</sup> and Vogel, speaking for the Potsdam observations, says that the brightness of the new star, which according to Pickering was certainly not of the eleventh magnitude on February 19, increased so rapidly that at 10 h. on February 23 it had attained magnitude 0.24; a rapid increase which he says,—“permits us to assume enormous disturbances in the atmosphere of the star.”<sup>8</sup> The color of the star, as first seen in the Yerkes Observatory, University of Chicago, February 24, was, G. E. Hale reports,—*Yellow with a reddish cast.*<sup>9</sup>

The Nova then diminished in brightness, irregularly, till on

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<sup>7</sup> *Science*, Nov. 29, 1901, page 860: “The New Star in Perseus.”

<sup>8</sup> *Astro-Physical Journal*, April, 1901, H. C. Vogel: “On the Spectrum of *Nova Persei*.”

<sup>9</sup> *Astro-Physical Journal*, March 1901; Geo. E. Hale; Bulletin 16, Yerkes Observatory.

June 1st it was on the limit of visibility. The spectroscopic returns at this time run as follows:

Potsdam Observations (Vogel. *Astro. J.*, April, 1901), report, February 23, at time of the maximum brightness of the new star, that the photographs of its spectrum, "which with a simple ocular spectroscope was very brilliant," were found to be almost without detail, to the no small astonishment of the observers.

There were no emission lines whatever; and of absorption lines only a few of hydrogen, diffuse and weak; and a couple of calcium lines. February 26th—Emission lines begin to appear; and increasing structural detail in spectra of later photographic plates.

The Lick Observatory reports February 24th,—Hydrogen band bright and broad on a strong continuous spectrum. February 25th,—Hydrogen; probably sodium.

The Yerkes Observatory, February 24th, inferred (by comparison spectra) hydrogen, sodium, titanium. On February 28th,—Hydrogen lines, bright and broad; dark lines superposed, probably due to reversal caused by absorption of outer layer at lower temperature. Bright sodium line: Helium line, Calcium lines, magnesium; chief nebular line seems to be present.

From Potsdam, Vogel reports that between February 26th and March 4th there was a change in the spectrum; absorption lines distinct, and accompanied by broad emission lines; and comments: "In a word, the spectrum has become that typical of a new star, and shows on a large scale the changes which Wilsing's observations have shown to occur in the spectra of metals and of hydrogen under high pressure."

Lockyer's observations (Pro. Roy Soc., December 2, 1901) note April lines as broad and hazy,—afterwards narrower and clean edged; the early prominent lines of hydrogen as afterwards weakened; and enhanced lines of iron, magnesium, etc.—conspicuous on early plates—as disappearing later; while Yerkes Observatory (April. *Astro. J.*) reports,—observations between February 25th and April 10th show falling off in intensity in less refrangible region; continuous spectrum much

fainter; and early lines diminished in intensity. This is confirmed in general by Bulletin 8, Lick Observatory.

For March, 1901, to May 3, Pickering reports changeable spectrum, varying daily,—but in general fluctuating between two types seemingly connected with marked changes in the brightness of the star itself. One type presented a strong, continuous spectrum, with hydrogen lines normal, and coincided with those periods when the star brightened greatly. The other presented a weak continuous spectrum; lateral extension hydrogen lines; strengthening of various bright lines;—and coincided with periods of minimum light. For June 25th he says: “An examination of the Draper photographs of the spectra of *Nova Persei*, No. 2, . . . shows that, like other *Novæ*, it has been gradually changing into a gaseous nebula;” although comparison with a nebular spectrum seems to show its chief nebular line to be relatively weak (*Astro. J.*, July, 1901). The Lick Observatory, Bulletin, No. 8, reports the spectrum of July 9th as that of a nebula. The particular form characterizing a telescopic star or sun is, however, still retained, as is noted in *Science*, November 29th, 1901. The Nova at that date being “according to the spectroscope a nebula, although retaining to the telescope the point-like form of an ordinary star.”

A scheduled summary of reports would run:—*February*, 1901, a new star appeared in Perseus, the light of which increased within four days from invisibility to the greatest brilliancy of all among the many shining star-suns of the Northern sky. It was then of a ruddy gold color, and at that early maximum of overflowing radiance presented the peculiarity that although its spectrum was very brilliant it was almost without structure, having but one or two absorption lines. Then follows the rapid appearance of emission lines; the presence of both emission and reversal lines of hydrogen and the lighter metals. The early haziness of spectrum lines passed into greater definition and detail; and a final fading of the hydrogen and metallic lines on the spectrum coincided with the growing notable indication of the characteristic nebular spectrum; the lines of which have been partly identified, as some of them coinciding with certain hydrogen lines, and some either coinciding

with or closely approximating certain lines characteristic of nitrogen; the lines of a nebular spectrum not appearing until some time subsequent to the appearance of the star and its early radiant maximum, and then only establishing itself gradually. Thus the nebula is manifestly an effect and not a cause in the production of a new star.

This gradual change in the character of its spectrum occurred in Nova Persei without the new star losing to the telescope the point-like form characteristic of an ordinary star-sun.

It is of profoundest interest to study the series of phenomena by light of that series of event which Swedenborg says follows fast on the creation of any active solar area in that universally-extending volume of First Aura or primal ether, which he says is coextensive with the Universe itself—is *in plenum* throughout the Universe and is antecedent to suns and solar systems.

First of all, he says, there is the expanse of this most pure, serene, primal ether, the First Aura,—quintessential, wonderful, extending throughout the created universe.<sup>10</sup> Then the Lord begins,—establishes,—creates and maintains, somewhere within the universally extending expanse of the Primal Aura, a new solar-center or active solar area, which from the beginning is both kept in those fine alternating expansions and contractions which send out their message of light and power into the surrounding deeps of the Universe; and in a rotary motion which begins to urge and solicit and draw into a like vortico-rotary-gyre that portion of the primal Aura which touches and presses it about. Next there begins,—by instrumentality of the centrifugal force exerted by adjacent layers of Primal Ether already “in gyre,” upon layers further away not yet drawn into motion,—a certain compression of the ether-substance itself; at a little distance from the immediate active area.

The first result of this compression is the formation of a layer composed largely of those particular composite-substantial-entities which are termed by Swedenborg, “Third Finites” (or finites of the third grade);<sup>11</sup> which third finites are learned from

<sup>10</sup> *Economy Animal Kingdom*, Part I., 638; Part II., 166; 312; 339. *Regnum Animale*, IV. [VI.]. *Lesser Principia*, 62-3.

<sup>11</sup> *Principia*, Part I.; Chap. VIII., 3-4.

the connections of their various series of ultimate uses to be the particular grade of primitives-of-ponderable-substance which are basic to hydrogen and the metals. These, excited by the surrounding motion and communicated heat agitations, would at once begin to send out the various vibrations characterizing them, upon the ether, giving rise to their own peculiar spectrum lines.

After the formation of a volume of these is well begun, the volume of magnetic ether can begin to be moulded; not before. For the molecules of units of the magnetic or secondary ether which constitute the proper solar sphere, are vortico-corpuseular forms, the envelope of which is framed of a mass of third finites; the center being far less dense, and occupied only by a very little active area occupied alone by a few flying finites of a finer grade. But so soon as third-finites exist, the volume of magnetic ether begins to be formed about the solar center, and flung outward; flying with tremendous outrush, and gyring as it goes, toward the confines of the sun's active power. Immediately after the formation of the substance of this solar sphere of secondary or magnetic ether,—by means of a compression, produced by the greater centrifugal effort and pressure of layers nearer the active area,—and therefore in faster rotation, upon layers further remote,—there begins to be moulded a mass of that distinct Fourth-grade of primeval or primitive matter, called Fourth Finites or substantialials. These Fourth Finites constitute the mass of the primeval substance of the planets; and from their connection and relation in other series of use, we know enter into the substance of electricity (Swedenborg's Third Ether), give its characteristic element to the "lightning fire" of Jove, and are part of the constitution of all nitrogen compounds, entering also the carbons.

It is to be noted that this *compression* mentioned as the means of moulding new grades of primeval "substantial entities" to serve among other uses as the primitives of new families of ultimate chemical compound,—does not at all result in the production of a mere general agglutinated and indeterminate mass, as might be inferred. The sort of thing which does result, Swedenborg says, and that necessary substantial and motor basis

in the material acted upon by the compression which he postulates as a cause of such result, may perhaps be presented justly, although in briefest compass, by an illustration drawn from the Kinetic Theory of Gases; with modifications.

This Theory, as Meyer gives it, is as follows:—"In the gaseous state [the individual particles of matter] are entirely detached from each other; each particle moves around with great rapidity and rushes forward in a straight line until it comes in contact with another particle or some other impediment, from which it rebounds like an elastic ball and continues its movement in a new direction." From the premise in this theory, that the native path of these particles is a straight line, it follows that if a volume of them were confined within finite limits and always colliding with each other, yet they are supposed never to form—and never have any tendency to form—composites and associations among themselves,—but at the end of ages the volume is assumed to be the same volume of unasociated individual colliding particles it was at first.

This assumption, according to Swedenborg, will be true *if* the orbit of the particles *is* a straight line, or is an unclosed orbit. But if the orbit of the particles be a *closed* one, of finite diameter relatively to the boundaries of the space, *it will not be true*. For in case the orbit of the particles be a closed orbit—a ring say,—at the end of indefinite time we would find within our vessel a number of rings, formed by the association of numbers of particles arranging themselves thus, at length, through many collisions, and these rings would exist as substantial entities which would possess something of the known characteristics of matter; i. e.—coherence, permanence, resistance, occupation of space within their boundaries. And this result will, according to Swedenborg, inevitably follow if the path of the supposed particles be a *closed orbit*.

Now according to Swedenborg, the primitive substantial entities first created of all, are to be conceived of about as are the particles or molecules in a volume of gas according to the kinetic theory; *with this alteration of the theory*, that they move, not in a straight line, but in a closed orbit. The closed orbit which he postulates for them is not a simple ring. It might

be roughly figured by the line the moon traces yearly in its progress round the sun by a circle of some thirteen loops. Or, a length of a dozen loops of spring wire uncoiled carefully from a spool and the ends brought around to meet give a fair idea of it. This closed orbit is supposed, in the case of the primitives of substance, to be of indefinitely small diameter. Now if substantive entities, possessing inherent kinetic energy and running in such a closed orbit, be brought together in a given finite space in sufficient abundance to be perpetually in free collision with each other, at the end of indefinite time great numbers of them will be found to have aggregated and associated themselves together in such a manner that they have formed a number of new substantial entities of the exact shape or configuration of their orbit; and the new compound-entities will possess a measure of coherence, resistance, permanence. In addition, if the closed orbit be of the postulated form, it can be seen that in the secondary-entities just spoken of, each given block of the substance composing it, will be tumbling or running around the entire ring, and thus the center of gravity of that block must be running around it also. This would result in "inciting" a certain rotary motion in the whole mass. And of the two motions would come a spring and conatus of the whole—under favorable conditions—to run into or describe a certain definite orbit of its own.

From which it would follow that these secondary kinetic entities if brought together under favorable conditions would, by means of collisions, at length arrange themselves by like process into like—but larger-aggregate—unities; with like, but less, kinetic energy,—manifested by an effort toward movement in like, but larger, orbits.

And these, Swedenborg says, are the actual, fundamental postulates of such result in nature: primitive substantial-entities, with intrinsic kinetic energy, moving in closed orbits, and in sufficient abundance to collide perpetually within the given space.

In *Nova Persei*, during the period extending from a time shortly after the first appearance of the new star to the establishment of its nebulous spectrum, there were coincidentally pres-

ent in its spectra pairs of bright and dark lines, or the emission and reversal lines respectively characteristic of a substance in a state relatively active or "fiery" and in one relatively quiescent or "cool;" lines which were probably produced, therefore, by "layers" respectively near to or removed from the star itself. In addition, there occurred a shifting or separation of the adjacent bright-and-dark lines in such fashion as implied that the layers from which they were respectively derived were in tremendous motion,—a motion which, interpreted by Doppler's principle, would indicate that the distance between the respective layers producing the bright and dark lines was rapidly increasing. As this feature of the spectrum of *Nova Persei* is characteristic of the spectra of *novæ* in general, the discussion of the questions involved is of wider interest, because of wider applicability.

In the *Astro-Physical Journal* for May, 1901, Pickering, in confirming the explosion hypothesis of the origin of *novæ* as against the collision, from phenomena presented by *Nova Persei*, adverts to the general grounds for the former hypothesis in a short article, page 277, from which we quote:

It was pointed out in *Astronomy and Astro-Physics*, 13, 201, that all the phenomena connected with the spectrum of a *Nova* could be readily explained if we supposed the appearance to be caused by an outburst of hot gases, which cooled as they receded from the star. The approaching gases being comparatively cool on the side turned toward us would present a spectrum of dark lines. The receding gases being hot on the side toward us would give a bright line spectrum. Since the direction of the velocity of the gases on the further side of the star in the line of sight was the reverse of the nearer gases, the latter could not mask the bright lines, and we should accordingly have a superposed spectrum of bright and dark lines as shown.

Later, after a comparison of photographs of different dates made it certain the faint surrounding nebula regarded the *Nova* as its center, about which it was revolving in an expanding or helix spiral,—Pickering sums the situation: "A luminous mass of gas is at the present time found to be receding from the *Nova* in all directions with an enormous velocity;" adding that it now seems certain that the velocities found in the nebula surrounding the *Nova* are very much higher than even the veloc-

ities that were at first calculated from the separation of the bright and dark lines. "This is a result," he says, "which could probably only be obtained from a continuously acting force." (*Astro J.*, December, 1901.)

On the other hand, Vogel, in considering this general question as to *Novæ* in the *Astro-Physical Journal* for April, 1901, says: "The relative motion of the two bodies, deduced from the separation of the centers of the adjacent dark and bright lines, led, however, to velocities so great as to be quite improbable." And he follows with most interesting applications of Wilsing's theory, to otherwise account for the large displacements of the lines. In the same number also may be found an article by Michelson, *On Doppler's Principle*, discussing the arbitrary application of a principle, based on sound (in which the source of the waves and the condition of the medium of propagation are within our reach), to the displacement of lines in spectra of celestial bodies; and suggesting several reasons for holding conclusions based alone upon such arbitrary application, tentatively only, not as dogmatic assumptions. In particular, he suggests two quite presumable cases in which interpretations of displacements of line in the spectra of celestial bodies, based on the Doppler principle as applied to sound, would certainly not hold good, i. e., in case the medium carrying on the waves of light be not at rest as a whole or in relation to us; and in case the medium through which they travel does not possess unchanged properties, as to density, etc.

The subject is one worth consideration from the point of view of certain cosmic-facts laid down by Swedenborg which may serve us as stepping-stones of approach toward it. For as Swedenborg gives some definite data, and outlines certain laws as to the series of substances and motor agencies concerned in the rise and progress of a new solar system in the universe, even until it is shaped complete,—active solar area, accompanying magnetic field, and planets, ready to offer themselves as fertile ovaries, co-operative, full of power, to the initiament of vegetable life.—what he says on the subject must stand as a general law covering all particular instances;—a law so wide of range, so sound and fundamental to the whole topic, that thought must reckon with it as a premise in all consideration of

the phenomena in given instances, if its conclusions are to run even fairly true to the trend of the actual developing facts, and attain that measure of certainty apprehendable by finite minds, which Plato would term "true opinion."

Now according to Swedenborg there is a tremendous centrifugally-directed force and pressure existent at and about every solar center or active solar area; and this from two causes. *First*,—the centrifugal push and endeavor of that irresistible rotatory motion in which the solar centre itself is, and into which it carries also its entire connected sphere. *Second*,—the whole force of those undulatory periodic *pressures* of light perpetually communicated by the active solar area to the surrounding ether-sphere; the entire sum of which is of course a centrifugally-directed push and pressure, since it radiates outward from that center in straight lines,<sup>12</sup> and thus acts upon any body only upon the side which faces the sun. For, according to Swedenborg's express statement, light, which is an undulatory motion of the ether,<sup>13</sup> the communicating center of which, in each solar system, is the active solar area central to the same,<sup>14</sup> remains as an actual undulatory motion only while still quite near that central area. For at a little distance from that center, Swedenborg says, the actual undulations become converted into a certain "undulatory pressure,"<sup>15</sup> not again to pass into actual undulatory motion until it comes in touch with the tellurian spheres and ponderable matter of the earths.<sup>16</sup> The means by which this conservative transformation of the actual undulatory motions of light, as they exist about that active center, into this "undulatory pressure," are two: *First*, the close contact of those vortico-spherical corpuscles constituting the mass of the magnetic ether sphere itself; and, *second*, the reaction, everywhere exerted, by that "etheron," that cosmic "protyle"—(The Primal Ether or First Aura of Swedenborg,—the same which he says in its volume is commensurate with the uni-

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<sup>12</sup> *Principia*, Part III., Chap. V., 20. *Lesser Principia*, 118-130.

<sup>13</sup> *Economy Animal Kingdom*, Part I., 170; Part II., 260, 293.

<sup>14</sup> *Economy Animal Kingdom*, Part I., 170, 299-306.

<sup>15</sup> *Lesser Principia*, 120, 124-5, 130.

<sup>16</sup> *Lesser Principia*, 126.

verse)<sup>17</sup>—which fills all the interspaces between the individual corpuscles of the magnetic ether sphere, as well as defines and bounds about all the endlessly many solar spheres themselves, and swings them in its vaster flow.<sup>18</sup> The whole force of the elastic reaction or repressure of this Aura,—as it comes in from the surrounding flowing deeps of the universe, is everywhere within the periphery of a solar sphere *centripetally* directed, and convergent in upon the solar center, and everywhere by its efficient reaction prevents the energy of the communicated-motion of the active solar center from being degraded or “dissipated,” and conserves it to those proper ends and uses for which it was imparted. These ends and uses are two: The first use is one we partly understand, experiment and thought having in some sort apprehended its fact,—i. e., the motor energies communicated to the tellurian spheres and ponderable matters of the earths. Knowledge of that *Second* use, however, so far as I am aware, we receive from Swedenborg’s statements alone. This use,—one operated throughout the area of the magnetic ether, during that period while it remains as a periodic “undulatory pressure” alone,—being not inconsiderable to the magnetic ether itself; for by it the magnetic ether corpuscles (molecules, units) are perpetually stimulated and forced to a certain intra-corpuscular periodic motion,—within their own boundaries alternately condensing and expanding again, as the alternate expansions and contractions of the acting solar area communicate to the substance of its vast surrounding sphere these traveling waves of alternate pressure and release. And some such perpetually-communicated, intra-corpuscular animation, or alternate expansion or contraction, is necessary—Swedenborg states—in the case of all ethers, to the maintenance of the integrity of their corpuscular or molecular form, and the spring, intrinsic motile energy or *vis motiva* characteristic of their primitive substantial entities.<sup>19</sup> For solar systems themselves

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<sup>17</sup> *Economy Animal Kingdom*, Part II., 312, 339.

<sup>18</sup> *Economy Animal Kingdom*, Part I., 604, 635-9.

<sup>19</sup> “Wherever in the world, or in the earth’s Kingdoms, there are substances endowed with active power and force, and therefore intended for performing certain functions and generating certain effects, there those substances are constantly excited, by extraneous causes, to a

most widely and simply considered as to substance and force *per se*,—are palpitant spheres; and within the proper boundary of each is going on a fine economic circulation of substance and of motor forces,—the continually renewed spring and energy of which comes from the two great primal motions in which the central active area, the solar center itself,—is perpetually held, i. e., that of rotation, and that of a swift, fine alternating expansion and contraction. Which two motions communicate as it were the cardiac and pulmonic motions to the entire surrounding system. For which two motions—both as to their first origin and beginning in the first initiation of solar centers, and their maintenance so long as those centers last,—the solar centers themselves are interiorly dependent upon the like motions of the spiritual sun. “For that Sun acts these two motions from the Lord.”<sup>20</sup>

This is probably because the light and heat motions are listed among the seven things not creatable along with substances, as an inseparable property of substance or any development of its potency of action; so there can be no light and heat motions in the universe, save as the Lord imparts them to it in the first place and momentarily ever after.<sup>21</sup> Thus for the communication of them the natural universe, as well as the spiritual universe, is directly and momentarily and forever dependent upon the Lord. “For in the Sun where the Lord is and which is from him, there are these two motions: and hence [they are] in the

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species of respiration or animation, and this, both in general and in particular. Apart from such incentives or excitations, the subjects would be bare forms . . . subject to collapse . . . The same remark applies to the world's atmospheres; were they not to be roused, generally and individually, into something emulous of an animatory or respiratory motion they would instantly . . . change into heavy and sluggish things. . . . Oscillations, vibrations, and modifications are nothing more than reciprocal and alternate expansions or contractions of a mass or volume; of the parts in a mass or volume; or of the individua or singulars in the parts. . . . So likewise in the atmospheres of the world;—if they also in general, or in their greatest volume, or in the least volume, that is in their unit [molecule] alternately contract and then regain their pristine dimension, then, of course, there is no reason why these actions should not be likened to the modes of respiration: for in both cases there is expansion and constriction: and in both cases the subjects are roused to perform operations corresponding to their form.” (*Animal Kingdom*, 392 (a, b).)

<sup>20</sup> *Divine Love and Wisdom*, 392.

<sup>21</sup> *True Christian Religion*, 472, 308.

angelic heaven and in the universe.<sup>22</sup> Thus they are from the Lord; for the Lord only can impart to solar centers the perpetual spring of their radiant light and heat motions.

Now the force of both these solar motions is a centrifugally-directed force; and that from the very initiament and first beginning of an active solar area in the expanse of the primal ether, or First Aura. Thus it would tend to drive all bodies subject to it directly away from the solar center; and that at a great speed.

But there is a second thing to be considered as bearing not less upon the question immediately in hand. This is the rotary drift of the entire solar sphere.<sup>23</sup> This drift is immense; its velocity high; and it affects the motion of every body coming within range of its action. But the layers of this sphere at various distances from the solar center, perform a complete rotation in different times. For instance, in our own solar system the layer nearest the sun revolves with a period about coincident with that of the sun's own rotation, while at the distance of the earth's orbit the period of revolution is some 365 days. Now in every solar system this drift has to be reckoned with; and that from the initiament of the solar area; for the mass and sphere of the magnetic ether is formed about the new solar center previous to the formation of the primordial planetary substance; its gyre and flow being indeed that very stream which, taking the planetary masses while they are as yet an uncondensed congeries of inchoate matter, in fiery freedom of motion bears them in helix gyres, shaping and massing as they go, to that place in its own swirl where the total of substance and kinetic energy in the planet proper, *plus* the like total in the locally surrounding sphere of the electric substance—will be equal to the total of substance and kinetic energy in the volume of magnetic ether displaced by the planet *plus* its surrounding-sphere of electric substance Swedenborg calls the third ether, or finest tellurian.

And if this be so, this drift has to be reckoned with in the interpretation of the spectra of celestial bodies. For it makes it certain that the medium through which the light of the bodies

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<sup>22</sup> *Divine Love and Wisdom*, 381.

<sup>23</sup> *Principia*, Part I., Chap. X., 6. Part II., Chap. I., 22. *Lesser Principia*, 124-5.

is transmitted—is a moving medium, with distinct differences of density as well as of speed of motion. And that there is such a medium revolving about Nova Persei is to be inferred from the gyre the successive midsummer and early fall photographs showed in the fine nebulous condensations surrounding the new star; and also the computed velocity of that gyre at that distance would perhaps give a basis of general estimate as to the time of rotation in the layers nearer the center itself, if compared with what is known of the like rotation in our own system.

Yet, in turn, we should consider that this magnetic sphere did not always exist about the solar center; that in fact the very ether-substance of which it consists only began to be moulded close about that center at a period immediately following the formation of any considerable volume of the Third Finities, or primitives of hydrogen and the metals; and although the magnetic ether was formed in the midst of a rotary movement of the Primal ether, and is itself by nature most apt for the like movement, yet it had to be flung out from that center toward its place of equilibrium, with tremendous outrush and radial expansion, gyring as it went, before it all settled down to its place and the gait of its regular rotation.

Therefore about *novæ*, at that early epoch we should find evidence of the radial outrush predominant over the evidences of rotational drift, although that also must exist. But in old established solar centers we would find the precise contrary,—i. e., the settled rotational movement predominant over the radial; only so much of the latter being present as sufficed to keep up a quiet circulation in and out at the poles and from center to circumference through the vast vortex wheel of that immense field of magnetic ether which surrounds the solar center as an inseparable companion, going with it when it goes, revolving with its rotation, bearing the planets in its flow, and marking the confines of that particular solar system by the limits of its mass.<sup>24</sup>

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<sup>24</sup> The centrifugal swing and push of this entire rotary motion, characteristic of active solar areas as wholes, being less at their poles than at their equators, of itself furthers and impels a continual inflow of the surrounding ether volume at the poles and outflow at their equatorial belts, which affords a powerful central spring of stimulus and re-

But the mention of the midsummer photographs of Nova Persei leads us to the second series of data concerning it; which is perhaps the most interesting of all. For the later series of photographs not only developed the certainty of a structural connection between sundry faint and rapidly fading nebulous swirls surrounding the *nova*, but they made certain the fact, "before the light of the nebulous wisps and condensations went out," that those condensations were in the gyre of a mighty whirl around the new star, at velocities only comparable to the speed of our planets around their sun; the like of which had never been dreamed of in the heavens before,—nor such speed nor the fiftieth part thereof, measured among the stars.

The record of this most notable second series of data covering what is known of "celestial events" attending the appearance of the new star, runs as follows:

*Science*, November 29th, 1901, states that "in August, photographs were secured at Heidelberg of extremely faint patches south of the star. September photographs, Yerkes Observatory, showed nebular cloud; very nearly circular, varying in intensity in its different parts, with the new star situated near

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newal to the circulations of that large vortical flow of the surrounding volume of ether,—to which indeed the two higher ethers are natively apt and prone whenever and wherever active centers are afforded them for its beginning and maintenance.

In the second place, it is to be noted that while the *Lesser Principia* says certain first-finites,—normally existent between the molecules of Primal Ether,—when that ether begins to be compressed by new forces set up by the activities of the newly established solar center,—being expressed from between those molecules, can betake themselves nowhere save toward the poles; where they may even enter the Active Solar area itself; in which space they are able to abide and be in full freedom of their inherent orbital motions. Yet, since Swedenborg's postulate definition of an active space, or area, is that any finites existent therein shall be so few relatively to the given area that they are at once in full freedom of individual Kinetic activity; and, practically, never collide,—it at once becomes apparent that we cannot look to these finites themselves for the cause either of the establishment, maintenance, or implosion, of such active solar areas amid and against the surrounding pressures of the universe; and that the two great characteristic motions of Solar centers which are the springs and centers of energy to their dependent spheres, are in no manner whatever, even remote, an additive product of the inherent orbital motions of those finites which have, in the given space, found refuge, harbor, and freedom of activity:

But for these things, in beginning and continual maintenance, the serene and omnipotent activities of the Infinite, present in space, without spatial limitations, are alone adequate.

the middle of the nebulous ring. And later photographs, when compared with those of September, made certain that the brightest portion of the nebula, and perhaps the whole, had moved to the south-east more than one minute of arc in six weeks. Motion on this enormous scale or a fiftieth part of it has never been observed for any celestial body outside of the solar system."

The event was of sufficient importance to telegraph from place to place and to the editors of scientific journals. *Nature* (November 21, 1901) reports on the photograph of *Nova Persei*, little or no nebulosity immediately about it; completely surrounding the new star, however, is a large elliptical belt of nebulosity, with patches of varying density, the most intense being in the southern half of the ring; the latter, probably identifiable with the four principal condensations previously noted, show evidence of motion of those constituent portions of the nebula. Structure of the nebula very complex;—question whether it is spiral or consists of several annuli with interlacing branches cannot be decided. A later note is made, November 17th;—that the nebula surrounding the new star is probably expanding in all directions.

The *Astro-Physical Journal*,—October,—gives the report of the Yerkes observations of the nebulosity about the *nova* from the photo of September 20th, as showing little or no nebulosity immediately about it, although two nebulous wisps extend from the Nova toward the west, curve north, and merge into the convolutions of the nebula proper. The nebula itself is of complex structure;—difficult to discover whether it was spiral, or consisted of several rings with interlacing and merging branches. In the same number of the *Astro-Physical Journal*, E. E. Barnard gives some pertinent observations made on No. 2392 with the forty-inch Yerkes Telescope. He found a bright star in a brightish ring of oval form almost incomplete in south portion. This ring was surrounded by a vacuity, outside which was a broad ring of light, less than the inner ring, broken on north. The inner ring was filled with nebulous light, which had a bright spot in it, south. Another bright spot was found coming to focus with the nebula and not with the central star—therefore doubtless a condensation of the nebula.

The December *Astro-Physical* gives a very full report from the Lick Observatory, under the head: "Motion in the Faint Nebula Surrounding Nova Persei." The photograph for November 8th showed that:—

—The strongest nebulosity is very near to the Nova, adjoining it on the south and west. This mass is elongated in a general direction south of east and is nearly two minutes of arc in length. There are a number of very faint wisps south of the Nova—the outer ones being the stronger . . . these outer wisps are concave toward the Nova, on the arc of either a conic section, other than a circle, or of a spiral. . . . To the north of the Nova, and seeming to join it, there is a faint mass of nebulosity, while farther along in the same direction are traces of other masses.

A comparison of this negative with the reproduction from a photograph secured by Mr. Ritchey, with the two-foot reflector of the Yerkes Observatory, on September 20th, reveals some remarkable changes of position in the more pronounced condensations. . . . Only four of these condensations are sufficiently defined to make determinations of position certain enough for purpose of comparison. . . . The line drawn between these positions—(i. e., positions of the four masses of nebulous condensations on the nights of September 20th and November 7th, respectively), for each condensation, indicates the direction and amount of motion in the interval of forty-eight days. . . . It will be seen that the displacements agree well, and amount to about  $1\frac{1}{2}^{\circ}$ . The directions are not so consistent and could perhaps be explained by the irregular motions in the nebulous mass, by a general translation of the nebula in one direction, or by a spiral motion. It is certain, however, that the motion is not radial. The amount of motion is almost incredible, being no less than at the rate of  $11^{\circ}$  per year. The greatest displacement (proper motion) in the stellar Universe so far observed is less than  $9''$  per annum.

Such an exceptional velocity as is here indicated leaves little doubt of the intimate connection of this nebulous matter with the Nova and its outburst. . . . It may be that in the outburst of *Nova Persei* we have seen the formation of a nebula, either planetary or spiral."

To understand the probable significance of the tremendous velocities at which the instanced nebulous condensations appear to be circling the *Nova*,—velocities comparable only with our own planetary velocities,—consider the case of our own solar system. We know that its active solar area possesses a certain motion of translation, at a definite velocity, proper to itself alone. We know, too, that the planets always accompany it as it moves in its own vaster orbit of the ages,—and that they

perpetually subcircle it, as they go. Thus we know certainly that whatever be the absolute velocity of our sun in its own orbit, its planets are moving much faster. For at every step of the sun's own progression, its planets run entirely around it, making one complete revolution at their respective distances. Now an observer situated at some far, skiey distance, at the present age would be able to see and chronicle only the proper motion and velocity of progression of our sun or star, in its own orbit. The higher speed of its subcircling planets would be an unknown thing, because the faint reflected light they possess at present would not carry far across the skiey deeps. But if he had been able to observe our solar system at that earlier epoch of cosmic history, when the primitive substances of our planets were not yet reduced by environmental instrumentalities to their present relative quiescence, but were still in the state of an uncompact congeries of the primitives of matter (the "atoms" of which atoms are compounded) in such freedom of motion that their stroke and impetus continually struck out upon the surrounding ether those vibrations which send *light* waves flying,—then the path of these planetary congeries of matter circling their star, and the mighty speed of their motions along that path, would have been made manifest to his eyes; even as the light of a burning ship in a maelstrom will render visible on the darkest night both the dimensions of that circle which it is then traveling and the velocity of its motion therein; or as a blazing torch carried by a runner sends information to farthest beholders both of the path in which he is running, and of his speed.

Somewhat such is the information which has come to us from the series of photographs, fixing the successive positions of the several condensation masses in that far-off and rapidly fading nebulous-swirl developed around *Nova Persei*, and giving data to measure the immense velocity at which those dim, flying-radiances are sub-circling the new star; velocities comparable alone to our own planetary speeds about the active center of our own solar system.

All which affords to thought the happy conjecture that in those far blue deeps the ever-creating Lord of Nature and of Force and of Life has but lately initiated and established a new

active solar area in an unoccupied expanse of the Primal Ether; and at once, through the proper activity of that central solar area "as father" and the substance and elastic reactivity of the surrounding Primal Ether as "mother," is fast framing the substances and parts of a new solar system; and that the first-shaped masses of the primeval planetary congeries are even now there flying toward their goals in the circling sphere, bye and bye to be moulded into earths whereon will rise the homes of a human race, new-born there from the Lord; glad to be created; and furnishing new brothers for the labors and the loves of heaven.

LILLIAN BEEKMAN.

## NOTE AND COMMENT.

### THE SWEDENBORG SCIENTIFIC ASSOCIATION.

#### ANNUAL MEETING.

The Fifth Annual Meeting of the Swedenborg Scientific Association will be held in the College Building of the Academy of the New Church, Bryn Athyn, near Philadelphia, Pa., on Wednesday and Thursday, May 28th and 29th, 1902. All reports and communications for the meeting should be sent to the undersigned before May 10th.

By order of the President,

EUGENE J. E. SCHRECK,  
*Secretary.*

4219 Ellis Ave., Chicago, Ill.

The Program of the meeting of the Swedenborg Scientific Association is given on page 100.

*Swedenborg and Modern Idealism; a Retrospect of Philosophy from Kant to the Present Time*, by Frank Sewall, M. A., has appeared, after long announcement, from the press of J. Speirs, London. It is a book of 244 pages, and embraces, besides some essays which have already appeared in *New-Church* and other Reviews, an introductory essay on the