

NOTES AND COMMENTS.

THE GLACIAL THEORY.*

SIR HENRY H. HOWORTH'S work on the Drift Beds, entitled *The Glacial Nightmare*, is notable for several things. His own comment is marked by that large common sense which Goethe says is indispensable to a scientist, if he is not to be ranked, by the judgment of a wider range of facts, as the brilliant leader of a false start. It contains a resume,—scholarly, capable and honest, of the gist of observation and deduction made by students of the subject,—a full storehouse of the historical side, and in which, as the author trusts, “justice has been done to some men at least . . . whose keen eyes and whose sound judgment it has been the fashion to decry.” It is interesting to lovers of Swedenborg, both because of the strong position he takes against the modern forcing of the Glacial theory, and for the finely accurate summary of Swedenborg's own statement, which is properly credited,—a rare thing, as few of Swedenborg's outside readers are scrupulous in keeping the scientific decalogue which Howorth says “prescribes, *inter alia*, that the man who first makes a scientific deduction is entitled to the credit of it.”

Howorth quotes, as the motto of his own investigations, from Adam Sedgwick: “. . . the language of theory can never fall from our lips with any grace of fitness, unless it appear as the simple enunciation of those general facts with which, by observation alone, we have at length become acquainted;” and in the pursuance of study along these lines he has come to stand for the Diluvial theory of Drift phenomena as against the Glacial.

Some quotations illustrating the boldness of his challenge to the reigning theory may be interesting. The preface opens:

It is a singular and a notable thing, that while most other branches of science have emancipated themselves from the trammels of meta-

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physical reasoning, the science of geology still remains imprisoned in a *priori* theories.

And later he adds:

I hold that the Glacial theory, as ordinarily taught, is based, not upon induction, but upon hypotheses, some of which are incapable of verification, while others can be shown to be false, and it has all the infirmity of the science of the Middle Ages. This is why I have called it a *Glacial Nightmare*. Holding it to be false, I hold further that no theory of modern times has had a more disastrously mischievous effect upon the progress of Natural Science. It is not merely in the domain of geology that its baneful influence has been felt. We cannot take up a text-book, in which the profound problems of Biology are treated,—problems like the distribution of animals and plants, the pedigree of life, the origin, and beginnings of the human race,—without being impressed with its influence as a factor. In all these and many other inquiries, the postulate of an ice age forms a necessary element of current theories.

The arguments of Lyell and his school, Howorth thinks, are also inadequate to explain “the superficial mantle of gravel, clay, sand, etc., which covers the ragged and ruined surface of the older rocks, and gives to the earth its generally smooth and undulatory outline,” and he continues:—

. . . My own conclusion largely involves a return to the views of those older geologists who wrote before the world was dazzled by the extravagant development of the Glacial theory, and because their careful labors have been recently ignored.

With the argument of Uniformity in Nature’s action at the basis of the Glacial theory, he takes square issue, so far at least, as concerns vigor or intensity of operation; and he cleverly quotes Conybeare’s translation of that argument as applied to geology: “Because a child grows two inches every year, therefore, that is the normal growth of a human being during the three-score years and ten which are his allotted pilgrimage.” For himself he adds:—

My masters, Sedgwick and Murchison, taught me a very different lesson which I have seen no reason whatever to unlearn. They taught me that no plainer witness is to be found of any physical fact than that nature has at times worked with enormous energy and rapidity, and at others much more evenly and quietly, and that the rocky strata teem with evidence of violent and sudden dislocations on a great scale.

That these catastrophes were aimless and lawless I do not believe. On the contrary, they were the result of law, but of a law whose tendency we have not yet perhaps duly measured, and whose key we might perhaps have discovered if we had not been pursuing the fantastic shadows of metaphysical reasoning for so many years. The earth seems to me to be full of evidence of intermittent violence and repose. In facing the solution of the Drift problem I must be taken therefore to postulate, not merely the possibility of catastrophes, but to maintain that they have occurred frequently in the world's history. Secondly, I would claim that while the Glacial theory makes demands upon the powers of ice which are inconsistent with its proved qualities and cannot be made to fit in with the facts which have to be explained, the power to which I appeal makes no demands whatever upon any force but that of which we can establish the competency, both by direct experiment and by theoretical calculation, and, that so far as we know, it explains all the facts. Thirdly, this explanation is one which was deemed satisfactory and complete by the Fathers of Geology, men who were quite as keen observers and quite as keen critics as their descendants, and who were also more independent and less dominated by official orthodoxy in science. For a long time some of the most brilliant masters of our science were advocates of the Diluvial theory as an adequate explanation of the facts. . . . Lastly, I claim to have established the necessity of this appeal on entirely different grounds. [No other so adequately and directly accounting for the general distribution of the Mammoth, etc.—L. B.]

An outline of the theory is given somewhat in detail, showing the auxiliary place of glacial action in the Diluvial operation, which may be summed up in brief as the early existence of glaciers upon the highest lands all over the globe, these glaciers in all latitudes being bordered by wide plains and forests in which lived the mammoth and mastodon and their hunters,—as the apteryx now lives in the luxuriant forests near the great glaciers in New Zealand. Then came the catastrophe caused probably by the sudden upheaval of some of the larger mountain chains, accompanied by vast subsidences of land elsewhere; this breaking up and change of the earth's crust, causing great oceanic waves of translation, overwhelming the land; drowning the living creatures and covering them with continuous layers of loam and clay, gravel and sand, as we find them covered; and also taking up the blocks of stone fashioned by the glaciers and transporting them to various distances, to be helped and piled according to wind

and tide; or scattered widely abroad. He denies strenuously, however, that his work can legitimately be used to support the Bible statement of a Deluge; which indeed he alludes to as "an early example of a widespread tradition, and nothing more." He claims his own work to be simply "an inductive argument from the facts," and merrily says, in allusion to the audacity of his position:—

The men of water had been long ago dispersed and scattered; the men who would dare to appeal to cataclysms and catastrophes are few indeed. Those who would venture to jeopardize their character for scientific sobriety by reviving and extending the views of the geologists of fifty years ago on great diluvial movements, are not to be found anywhere. Whether right or wrong in his conclusions, it is perhaps well that, among the erratic heretics who are careless of prestige and indifferent to conventional opinion, one should occasionally be found to challenge the dominant creed by assailing its foundations.

In the first chapter occur the mention of Swedenborg and a summary of his theory on the subject. After speaking of the innumerable boulders strewing the whole of Northern Europe, —and especially Sweden,—he continues:

The first scientific person, so far as I know, who referred to these moss-grown wanderers was that very remarkable man, Emanuel Swedenborg. The latter part of his life was so entirely devoted to the mystical and visionary schemes which culminated in the foundation of the Church of the New Jerusalem, that it will be news to many people to learn that in his earlier days he was an acute and distinguished man of science, a member of the Academies of Upsala, Stockholm and Petersburg, and that he filled the post of Assessor of the School of Mines in Sweden, and this at a time when Sweden was the nursing mother of modern Natural History. It was this official position that doubtless brought him into contact with the geological aspects of the surface deposits of the North, which he was the first to publish and to treat seriously. *Inter alia*, he not only refers to the boulders which are so conspicuous in Sweden, but he connects them with other phenomena, such as the long whale-backed ridges of sand and stones known to the Swedes as "asar," and he assigns a cause for both.

Then follows an excellent resume of Swedenborg's observation and arguments, as published in 1719-1722, which includes his theory that the sea was the active agent in positing both the asar and the scattered boulders, his deduction as to the

prevalence of the same winds in the Diluvial age as now; the greater height of the ocean then; his appeal to the principles of hydraulics to prove that the sea could have done this kind of work, as its pressure depends on its depth, being more considerable at a greater than at a lesser depth; and its trans-latory power being augmented by the fact that—"although stone, when in the air, is heavier than water as $2\frac{1}{2}$ is to 1, it is only $1\frac{1}{2}$ to 1 when immersed in fresh water, and still less in salt." On these grounds he concludes the phenomena of the boulders and the "asar" to be explained by the operation of the Diluvial waters. With this conclusion Howorth concurs, illustrating and expanding it by many details of recorded observation in the two dignified and interesting volumes of the work before us, a work well worthy of consideration by the students of Swedenborg.

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NEW REFERENCES TO THE "LIMBUS."

On page 67 of *The New Philosophy* for 1904, reference was made to the treatment of the "limbus" of Swedenborg in his manuscript *On the Mechanism of the Soul and the Body*, which has been printed by the Association in an English translation. Special attention was called to the active space inside the first elementary particle in connection with the composition and degrees of the "limbus." An extended analysis of this most interesting subject is impossible here, but it may be useful to note a few salient features of the manuscript material.

Swedenborg says in no. 11 of this work: "*That the soul is bound by rules, that it is bound by mechanical rules, and that it may be explored by mechanism and geometry*; and from what immediately follows it appears that Swedenborg considered all things, and among them the soul, to be created and thus finite, that is, all things save the infinite; and since space and figure are predicable of all things which are finite it follows that they are mechanical and geometrical; thus the soul is natural.

In no. 12 Swedenborg says: "*That the rational soul consists of actives of the first and second [finites], that they form little spaces, and round about there are surfaces from passives or finites*. Continuing, Swedenborg says that the soul is most active, being formed like the first elementary particle with actives of the first [finite] on the inside, and

second finites on the outside; thus there is a most subtle membrane within which are the actives, the soul being thus constituted,—the surfaces being joined together and forming an extense. The soul is thus an expanse which is distributed throughout the body. (No. 13.) The souls of brutes consist of grosser expanses, for they cannot have the actives of the first and second [finites]. (No. 14.)

In no. 15 Swedenborg says: "*That this expanse cannot be dissolved or broken without the parts or the whole betaking themselves into a globe or into themselves, so that it may lie together.*"—"Such a soul flowing together will occupy a least space" (No. 17).—"Such a soul can be hurt by no element or by fire" (n. 18).—"That thus conglomerated, it may expand itself again" (n. 19).—There are many further statements concerning the souls of men and of brutes, the distribution of the soul throughout the body, its activities and means of communication, etc., etc. At the close of the manuscript the immortality of the soul is treated of as follows:

"48. *When the man dies the soul lives*, because it cannot perish, since it consists of such subtle parts, which cannot putresce, neither perish by fire, nor by air, nor otherwise; therefore it remains.

"49. *That by death and by putrefaction* a great part of it perishes, or is dissolved from the remaining nexus; it follows the putrefied parts.

"50. *That the soul after death betakes itself in time more and more into a one* and separates itself from the grosser parts, no otherwise than the blood; the nexus being loosened, it can go together into a one, and in place of the tunic it will remain in one place.

"51. *That the ultimate which thus remains is the soul*, which in the course of time separates itself from grosser things; hence finally going together, it is the living soul.

"52. *That with the angels mediating* it thus comes into heaven; without their mediating I do not know whether it could thus live; therefore it is carried into heaven by the angels, when it has undergone its lustration.

"53. * * *; neither does it harm that parts are separated thence; for that which finally is the residuum is nevertheless the soul."

From this material, and also from other passages where the soul is treated of, it appears that the "soul," as Swedenborg here defines it, is composed of just those substances of which the "limbus" of the theological works would consist, namely, the highest natural substances, or the "purests" of nature. The student of the *Principia* will note that no substances are mentioned as composing it which are lower in degree than those of the sun and the first elementary particle; thus we may conceive of a trine in the "limbus," consisting of the point, the first finite, and the second finite, together with their actives.