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## ARTICLE X.

### DANA'S TRIBUTE TO GUYOT.

IN THE PROCEEDINGS OF THE NATIONAL ACADEMY is found a Memoir of Arnold Guyot prepared by Professor James D. Dana, and read the 21st of April, 1886. As some portions of this Memoir both explain and supplement Professor Dana's recent article in the *BIBLIOTHECA SACRA*, we give, by permission of the author, a summary and a somewhat extended extract.

Arnold Guyot was by Providence peculiarly fitted to write upon the relations between the Bible and science. Being descended from an old Huguenot family, Guyot was naturally inclined to the study of theology, and his early education was directed with reference to a career in that department of investigation. After taking the usual extended course both in philosophy and in the classical and modern languages, Guyot went, at the age of twenty-two (in 1829) to Berlin to pursue a theological course. Here he remained for five years, enjoying the lectures of Schleiermacher, Neander, and Hengstenberg. So that he is one of the comparatively few scientific men who had at the same time a thorough personal knowledge of biblical subjects. But other aptitudes of mind, and association with the leading scientific men of the period, led him at last to devote himself to science. In this department he attained an eminence, especially in the estimation of his peers, that is second to that of no other man of the century. With Agassiz he shares the credit of solving the problem of glacial movements in the Alps. Indeed, his discoveries antedated those of Agassiz, Rendu, and Forbes in this most interesting and important field of investigation; and he had no equal in the department of physical geography to the day of his death. His Lowell Lectures entitled *Earth and Man*, were translated into German, Swedish, and French, and the book is one upon which the celebrated geographer Carl Ritter set the very highest estimate.

Guyot's views upon the parallelism between the cosmogony of Genesis and that of modern science were formed as early as 1840, and were brought to the attention of Professor Dana and substantially adopted by him soon after Guyot's removal to this country in 1848. So reasonable and well supported were these views that they have received the widest acceptance, and may be justly said to have dominated the best thought upon that subject in America for the last thirty years; and, as the recent article of Professor Dana in the *Bibliotheca Sacra* shows, both Dana and Guyot saw increasing evidence of the correctness of those conclusions as science added new facts and theories to her stores of knowledge. The following is Professor Dana's re-statement of the origin and development of this theory in Guyot's mind (pp. 23-27):

The subject came under his consideration at Neuchâtel, in 1840, while

preparing a lecture for his course in Physical Geography. Looking only to the suggestions of science, under which the so-called nebular theory had in his mind a place, he made out a scheme of the successive stages in the earth's development. After its completion it "flashed" upon him that the succession arrived at was just that of the cosmogonic record in Genesis, and this led later to a critical comparison of the two. Harmonizing the Bible and science was, hence, far from his original purpose.

The succession in the scheme so derived was (as I learned it from him) as follows :

First. The endowing of matter in space with forces, whence the beginning of its activity.

Second. The stage of specialization, or that of the subdividing of the original matter or nebula through the forces communicated, and thus the development of systems of spheres in space.

Third. The stage of the individualized worlds—the earth among them—and the commencing preparation of the earth for new developments pertaining to organic nature.

The events thus far are those of the inorganic part of the cosmogony.

In the organic period there was :

First. Life, manifested in the simpler kinds of plants. Next, animal or sentient life under simple forms—the Protozoans. These simple kinds of plants and animals represented the first or germ-like or homogeneous stage in the development of the system of life. He believed it to be probable that both existed before the close of Archæan time.

Second. The stage of specialization, or that of the development of plants and animals of higher and higher grade, under various types and subdivisions, based severally on different structural and physiological qualities.

Third. The stage of the synthetic or harmonic type. Among plants, that of the Dicotyledons, in which the different kinds of tissues in plants, and the stem, leaf, and flowers are for the first time harmoniously combined; and among animals, that of the Vertebrates, in which the nervous system has first its proper commanding position; and, lastly, among Mammals, that of Man, eminently the "harmonic unit" for the system of life, combining the highest of structural qualities and physiological characteristics under the most perfect harmonious development.

It is not surprising that after the conception of such a scheme he should have recognized a relation in it to the record in Genesis. Looking to this record, which announces the grand stages in a few brief sentences, he observed that the "fiat" of the first day, "Let light be," indicated, since light is a result of molecular action, the imparting of activity to matter as the first step in the development of the universe; that the dividing of the waters on the second day appeared to have its only befitting explanation in the subdividing or specialization of the primal nebula, as stated above; and that the fiat "Let the dry land appear," on the third day, indicated the defining of the earth and the preparation of it by the appearance of dry land for its new work. Thus he found the first three works in Genesis to cor-

respond essentially with the first three in the scheme taught him by science. The following works, the creation (*a*) of plants, (*b*) of the Invertebrates and inferior Vertebrates, (*c*) of Mammals—the remaining Vertebrates, (*d*) of Man, have in the record the order of their first appearance as made known by science. It has to be admitted that doubt at present exists as to the earliest birds having preceded the Marsupial Mammals, but none as to their long preceding ordinary Mammals. Future discovery may place them before the Marsupials. Remains of birds are the rarest of fossil Vertebrates.

Guyot recognized also a still deeper concordance between Genesis and science, namely, that not only in the opening verses, but throughout the chapter, the idea of a system of development is taught. The fiat "Let light be" was the commencement of developments before the earth or other spheres had existence, not the creation of an entity. With regard to the earth, the first verse announces that it was formless, empty, waste, or, as the Septuagint translation describes it, "uncomposed and invisible." Then, on the third day, where the second mention comes in, the words are not Let the earth be, but "Let the dry land appear," implying that the specializing changes had gone forward eventuating in the earth and making it ready for future developments. The fiat creating plants was not Let plants be, but "Let the earth bring forth," which words imply development in some way; and a similar idea is to be derived from the fiats "Let the waters bring forth" for the Invertebrates and lower Vertebrates on the fifth day, and "Let the earth bring forth" for Mammals on the sixth day.

Such a system of developments, which, after an initiating fiat, continued on their progress through the ages following, was not consistent with the idea that the days of Genesis were definite periods of time. It teaches that they simply mark the beginnings of new phases or new grand stages in the history of creation.

Guyot's critical eye further discovered that the two triads of days in the record—the first, the *inorganic*, including days one to three, the second, the *organic*, days four to six—have three parallel features which emphasize strongly this subdivision of the chapter, and indicate parallel stages in the developments: first, in each triad, the work of the first day was light; second, in each, the work of the last day comprised two great works; third, the second work of the last day in each triad was the introduction of an element that was to have its full development in the following era; in the first triad this element was life, plants being the second work, and life having its chief display in the succeeding era; in the second triad it was spiritual life, that of man, a planting of the moral world in the material, for the exaltation of the latter in aim and character.

Guyot thus shows that the old document is philosophical in its arrangement, true to the principles of development in history, and essentially true in the order of its announcements, and that the best explanation which science is now able to give on the great subject of cosmogony is also that which best explains, in all its details, the first chapter of Genesis and does it justice.

I have said that Guyot, while adopting the law of development and applying it to all history, still believed that true species came into existence only by divine act. In his later years, as his work on "Creation" shows, he was led to accept, though with some reservation, the doctrine of evolution through natural causes. He excepted man, and also the first of animal life; for in the case of both, while science speaks undecidedly, the record in Genesis teaches, by the use of *bārā* for create, and by not using the word elsewhere subsequent to the first verse in the chapter, that actual creation was intended. He also held that there might be other exceptions; and he objected, moreover, on other grounds to the development of Man through nature alone. Still, as always with Guyot, God's will was the working force of nature, and secondary causes simply expressions of it.

Guyot's views on Genesis, although dating from 1840, and presented by him since that time in occasional courses of lectures, were not published in detail until the last year and hours of his life. With the publication of the volume his work and life ended.