THURSDAY, NOVEMBER 9, 1871

THE ORIGIN OF GENERA *

ALTHOUGH it is now two years since the publication of Prof. Cope's "fragmentary essay," as he modestly terms it, bearing the above title, it may not be out of place, in the present stage of the theory of Evolution, to give our readers some idea of its scope. It ought to be in the possession of every naturalist. Although already so condensed that anything like an analysis of it is impossible, the following tabular sketch may serve to give our readers an idea of the mode in which the Origin of Genera is treated :—

I. Relations of allied genera.
  First ; in adult age.
  Second ; in relation to their development.
    α. On exact parallelism.
    β. On inexact or remote parallelism.
    γ. On parallelism in higher groups.
    δ. On the extent of parallelisms.

II. Of retardation and acceleration in generic characters.
  First ; metamorphoses in adult age.
    α. The developmental relations of generic and specific characters.
    β. Probable cases of transition.
    γ. Ascertained cases of transition.
  Second ; earlier metamorphoses.
    δ. The origin of inexact parallelisms.

III. Relations of higher groups.
    α. Of homologous groups.
    β. Of heterology.
    γ. Of mimetic analogy.

IV. Of natural selection.
    α. As affecting class and ordinal characters.
    β. As affecting family characters.
    γ. As affecting generic characters.
    δ. As affecting specific characters.
    ε. On metaphysical species.

V. Of epochal relations.

Professor Cope considers that the laws which have regulated the successive creation of organic beings are of two kinds. The first, that which has impelled matter to produce numberless ultimate types from common origins ; the second, that which expresses the mode or manner in which the first law has executed its course, from its commencement to its determined end, in the many cases before us.

"That a descent, with modifications, has progressed from the beginning of the creation is exceedingly probable. The best enumerations of facts and arguments in its favour are those of Darwin, as given in his various important works, 'The Origin of Species,' &c. There are, however, some views respecting the laws of development on which he does not dwell, and which it is proposed here to point out.

"In the first place, it is an undoubted fact that the origin of genera is a more distinct subject from the origin of species than has been supposed.

"A descent with modification involves continuous series of organic types through one or many geologic ages, and the co-existence of such parts of such various series at one time as the law of mutual adaptation may permit.

"These series, as now found, are of two kinds : the uninterrupted line of specific, and the same uninterrupted line of generic characters. These are independent of each other, and have not, it appears to the writer, been developed *pari passu*. As a general law, it is proposed to render highly probable that the same specific form has existed through a succession of genera, and perhaps in different epochs of geologic time.

"With regard to the first law of development as above proposed, no one has found means of discovering it, and perhaps no one ever will. It would answer such questions as this. What necessary coincidence of forces has resulted in the terminus of the series of fishes in the perches as its most specialised extreme? or, of the batrachia, in the fresh-water frogs, as its ultimum? or, of the thrushes, among birds, as their highest extreme? in a word, what necessity resulted in man as the crown of the mammalian series, instead of some other organic type? Our only answer and law for the questions must be, the will of the Creator.

"The second law of modes and means has been represented to be that of natural selection by Darwin. This is, in brief, that the will of the animal applied to its body in the search for means of subsistence and protection from injuries gradually produces those features which are evidently adaptive in their nature. That, in addition, a disposition to a general variation on the part of species has been met by the greater or less adaptation of the results of such variation to the varying necessities of their respective situations. That the result of such conflict has been the extinction of those types that are not adapted to their immediate or changed conditions, and the preservation of those that are" (pp. 4, 5).

In the chapter "On the relations of nearly allied genera," he gives no less than eight "examples of exact parallelism."* We select one at random as illustrating the large number of facts he brings to bear on the subject of which he treats. "The Cervidæ of the Old World are known to develop a basal snag of the antler at the third year ; a majority of those of the New World never develop it, except in abnormal cases in the most vigorous maturity of the most Northern Cariacus : while the South American Subulo retains to adult age the simple horn of the second year of Cervus. Among the higher Cervidæ, Rusa and Axis never assume characters beyond an equivalent of the fourth year of Cervus. In Dama, on the other hand, the characters are assumed more rapidly than in Cervus ; its third year corresponding to the fourth of the latter. Among American deer there is the Blastocerus, whose antlers are identical with those of the fourth year of Cariacus.

"Now, individuals of the genus Cervus of the second year do not belong to Subulo, because they have not as yet their mature dentition. Rusa, however, is identical with those Cervi whose dentition is complete before they gain the antlers of the fifth year. When the first trace of a snag appears on one beam of *Cariacus virginianus*, the

* "On the Origin of Genera." By Edward D. Cope, A.M., Corresponding Secretary of the Academy of Natural Sciences of Philadelphia. Pp. 80. 1869. (Philadelphia : Merrihew and Son. London : Trübner and Co.)

* The author applies the term *exact parallelism* to the relation of genera which are simply steps in one and the same line of development ; while *incomplete parallelism* is applied to that of those where one or more characters intervene in the maturity of either the lower or higher genera to destroy identity.

dentition includes the full number, but there remain $\frac{1}{3}$ milk molars much worn and ready to be shed. Perhaps the snag is developed before these are displaced. If so the Cariacus is never a Subulo; but there can be little doubt that the young Blastocerus belongs to that genus before its adult characters appear."

From the examples of inexact parallelism we select the second and eighth.

"In both perissodactylous and artiodactylous mammalia certain types develop their family character of canines at the earliest appearance of dentition; others, not till a comparatively late period of life (Equus); and the extreme genera never produce them" (p. 14).

"In most serpents the left lung is never developed; in such the pulmonary artery, instead of being totally wanting, remains as a posterior aorta bow, connected with the aorta by a ductus botalli; serpents without left lung being, therefore, identical in this respect with the embryonic type of those in which that lung exists."

Under the head of "adult metamorphoses," in the second chapter, Prof. Cope explains his law of retardation and acceleration. It consists "in a continual crowding backwards of the successive steps of individual development, so that the period of reproduction, while occurring periodically with the change of the year, falls later and later in the life-history of the species, conferring upon its offspring features in advance of those possessed by its predecessors. This progressive crowding back of stages is not, however, supposed to have progressed regularly On the contrary, in the development of all animals, there are well-known periods when the most important transitions are accomplished in an incredibly short space of time (as the passage of man through the stages of the aorta bows and the production of limbs in the Batrachia Anura); while other transitions occupy long periods, and apparently little progress is made" (p. 37).

On these and other similar grounds, the author concludes, that "the transformation of genera may have been rapid and abrupt, and the intervening periods of persistency very long. As the development of the individual, so the development of the genus" (p. 38).

To the question—Has any such transition from genera to genera ever been seen to occur? Prof. Cope answers in the affirmative, and gives eleven probable and six ascertained cases, for the details of which we must refer to pp. 42—46.

Passing for want of space over the third and fourth chapters, we arrive at the concluding one, "On Epochal Relations, or those Measuring Geological Time," which abounds in valuable matter. The comparisons of different faunæ "indicate that an inherent difference between the types of a continent exists at the present time, though the difference is subordinated to a universal distribution of the higher groups throughout the earth. Has this state of things existed for any long period, or is it the result of different progress in the same group since the human period? Thus the present fauna of Australia was preceded in the post-pliocene and pliocene by forms possessing similar peculiarities, and belonging to the same classes: that is, by herbivorous and carnivorous marsupials and monotremes, and by Varanid Sauria, all of greater size than their predecessors.

"The same fact is well known of the Neotropical region, its present peculiar Edentata having been preceded by giants of the same type in the post-pliocene and pliocene."

In the Nearctic, the later Palæarctic, and the Palæotropical regions, the existing genera were similarly represented by pre-existing types, sometimes wonderfully developed.

"Prior to these faunæ another state of things has, however existed. North America has witnessed a withdrawal of a Neotropical fauna, and the Palæarctic the retreat of an Ethiopian type. During the post-pliocene in North America, Neotropical genera were to Neartic as 12 to 29, as the record now stands. In the pliocene beds of Pikermi (Greece) antelopes, giraffes, rhinoceros, hippopotamus, huge manis, monkeys, monitors, and other genera and species of African relationship, are the prevailing forms, and still earlier a strong mingling of Nearctic and more of Neotropical types abounded in the Palæarctic" (p. 77).

We have, then, three important terms from which to derive a theory of the creation:—(1) The existing six faunæ bear in many of their parts developmental relations to one another; (2) They were preceded immediately by faunæ similar to them in each case, but more remotely by faunæ like those now in existence; and (3) the Southern Hemisphere is a geologic stage behind the Northern one in progress, as is shown by its perfection in types extinct in the Northern, and by its inferiority in modern types prevalent in the Northern.

For a fuller demonstration of the last point we must refer our readers to pp. 78, 79 of this valuable monograph.

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MISS NIGHTINGALE ON LYING-IN INSTITUTIONS

Introductory Notes on Lying-in Institutions. By Florence Nightingale. Pp. 110. (Longmans, Green, and Co. 1871.)

MISS NIGHTINGALE tells us the story of this book somewhat as follows:—The Committee of the Nightingale Fund, with the view of extending the usefulness of their Institution for training nurses, entered into an arrangement with St. John's House and King's College Hospital, by which a special ward was set apart for the reception of poor women in childbed, and steps were taken for training midwifery nurses to be employed among the poor in their own houses.

After the ward had been in use for several years, the Committee were made aware that there had been many deaths among cases admitted; this led to inquiry, and the ward was closed.

The Committee being still desirous of continuing this special branch of their work, Miss Nightingale deemed it advisable to inquire into the whole subject of puerperal mortality, and the result is now before us in a form which we can all understand, and we will venture to say that to the generality of readers the facts will bear the aspect of an unwelcome revelation. These facts have been drawn from the Registrar-General's reports, from reports of public institutions in the United Kingdom and over most European countries, affording relief to poor women in their need, both at home and in lying-in institutions, and also from records of private practice.

They show that, while the death-rates for all England