

Professor Bowen raised similar objections; contending that this hypothesis is one of cosmogony rather than of natural history, and makes such huge demands upon time, that the indefinite becomes virtually infinite time, so rendering the theory dependent on metaphysical rather than inductive reasoning; he denied the validity of all reasoning from the variability of plants to that of animals, or that the two had enough in common to warrant inferences from the one to the other; he also denied the variability of instinct in any animals, or that there was any evidence of the heritability of variations of structure or instinct except in a few sporadic cases, and in these only for two or three generations. He insisted that there was no reason why, on the theory, instinct and structure should vary contemporaneously; and finally he maintained that the theory denied the doctrine of the permanence of type, as received by all naturalists, was incompatible with the whole doctrine of final causes, and negatived design or purpose in the animate or organic world.

Four hundred and eightieth meeting.

April 10, 1860.—MONTHLY MEETING.

The PRESIDENT in the chair.

Professor Horsford introduced Mr. Du Chaillu, who, invited by the Academy, gave some account of his travels in Western Africa, and of his observations of the habits of the Gorilla.

Professor Gray criticised in detail several of the positions taken at the preceding meeting by Mr. Lowell, Professor Bowen, and Professor Agassiz respectively;—premising that he had no doubt that variation and natural selection would have to be admitted as operative in nature, but were probably inadequate to the work which they had been put to. He maintained:—

1. That varieties abundantly occur in nature, at least among plants; and that very few of them can be of hybrid origin; that hybridation

gives rise to no new features, but only mingles, and, if continued, blends, the characters of sorts before separate; and that a hybrid origin was entirely out of the question in species which had no congeners, or none in the country to which they were indigenous; yet that such species diverged into varieties as readily as any other. As to the general denial, 1. that there is any such thing as natural selection, and 2. that there is any variation in species for natural selection to act upon, he could not yet conceive how such denial was to be supported; but to answer its purpose it would have to be carried to the length of denying that the individuals of a species ever have anything which they did not inherit; — slight variations, accumulated by inheritance, being just what the theory in question made use of, — taking little or no account of more salient and abrupt variations, though instances of the latter kind could certainly be adduced.

2. In opposition to the view that such variations as cultivation or domestication so copiously affords are of no account in the discussion, and have no counterpart in nature, Professor Gray maintained, that the varieties of cultivation afforded direct evidence of the essential variability of species; that no domesticated plant had refused to vary; that those of recent introduction, such as Californian annuals, mostly began to sport very promptly, sometimes even in the first or second generation; man having done nothing more than to sow the seed here instead of in California, perhaps in no better soil. Here the variations were as natural as those of the wild plant in its native soil. Man produces no organic variation, but merely directs a power which he did not originate, and by selection and close breeding preserves the incipient variety which else would probably be lost, and gives it a choice opportunity to vary more. Consider, he remarked, how small the chance of the survival of any variety when originated in its native habitat, surrounded by its fellows, — when not one seed out of a hundred or a thousand ever comes to germinate, and not a moiety of these ever succeed in becoming a plant, — and when, of those that do grow up and blossom, the danger is imminent that the flowers may be fertilized by the pollen of some of its abundant neighbors of the unvaried type, — and it will be easy to understand why plants vary so promptly in our gardens, mostly raised from a small quantity of seeds to begin with, probably all from the same stock, where they are almost sure to self-fertilize in the first generation, — where every desirable variation is watched for,

and cared for, and kept separate; — and it may be confidently inferred that they vary in cultivation, at first, much as they would have varied in the wild state, if such favorable opportunity had there occurred. Continued cultivation under artificial selection would of course force some of these results to an extreme never reached in nature, giving to long-cultivated varieties a character of their own. Yet they may not deviate more widely from the wild type than do some of the wild varieties of many plants of wide geographical range. Moreover, Professor Gray maintained that there occur in nature the same kinds of variation as those to which we owe our improved fruits, &c.; that such originate not rarely in nature, and develop to a certain extent, enough to show the same cause operating in free as in controlled nature; enough to have shown the cultivator what he should take in hand; enough to render it likely that most of our cultivated species of fruit began their career of improvement before man took them in hand. Instances of such variations in the wild state were adduced from our Hawthorns, especially *Crataegus tomentosa*, from our Wild Red Plum, Wild Cherries, and especially from our Wild Grapes and Hickories.

3. The view taken by Mr. Lowell, and especially by Professor Bowen, that the indefinitely long periods of time which the theory required and assumed was practically equivalent to infinity, and therefore rendered the theory “completely metaphysical in character,” Professor Gray animadverted upon, mainly to remark that the theory in question would generally be regarded as too materialistic and physical, rather than too metaphysical in character; and that, *a fortiori*, physical geology and physical astronomy would on this principle be metaphysical sciences.

4. Exceptions were taken against the assumption of such a wide distinction, or of any sharply drawn distinction at their confines, between the animal and the vegetable kingdoms, and especially against the view that instinct sharply defines the animal kingdom from the vegetable kingdom on the one hand, and from man on the other, and which denies to the higher brutes intelligence, and to man instinct.

5. Also, against the view that the psychical endowments of the brute animals, whether instinct or other, are invariable and unimprovable; and a variety of instances were adduced, as recorded in the works of Pritchard and of Isidore St. Hilaire, as well as some from personal observation, in which acquired habitudes or varied

instincts were transmitted from the parents to their offspring. That such acquirements, once inherited, would be likely to continue heritable, was argued to be the natural consequence of the general law of inheritance, the most fundamental law in physiology; that it is actually so, Professor Gray insisted was well known to every breeder of domestic animals.

6. For decisive instances of the perpetuity by descent or fixity, under inter-breeding, of altered structure, Professor Gray adduced Manx cats and Dorking fowls; and he alluded to well-known cases of six-digitated people, and the like, transmitting the peculiarity to more than half of their children, and even grandchildren; showing that the salient peculiarity tended to be more transmissible than the normal state at the outset; so that, by breeding in and in, it was likely that *hexadactyles* could soon be made to come as true to the breed as Dorkings.

7. As to the charge that the theory in question denies permanence of type, Professor Gray remarked that, on the contrary, the theory not only admitted persistence of type, as the term is understood by all naturalists, but was actually built upon this admitted fact as one of its main foundations; that, indeed, one of the prominent advantages of this very theory was, that it accounted for this long persistence of type, which upon every other theory remained scientifically unaccounted for.

8. Finally, as to the charge that the hypothesis in question repudiated design or purpose in nature and the whole doctrine of final causes, Professor Gray urged:—1. That to maintain that a theory of the derivation of one species or sort of animal from another through secondary causes and natural agencies negatived design, seemed to concede that whatever in nature is accomplished through secondary causes is so much removed from the sphere of design, or that only that which is supernatural can be regarded or shown to be designed;—which no theist can admit. 2. That the establishment of this particular theory by scientific evidence would leave the doctrines of final cause, utility, special design, or whatever other teleological view, just where they were before its promulgation, in all fundamental respects; that no new kind of difficulty comes in with this theory, i. e. none with which the philosophical naturalist is not already familiar. It is merely the old problem as to how persistence of type and morphological conformity

are to be reconciled with special design, (with the advantage of offering the only scientific, though hypothetical, solution of the question,) along with the wider philosophical question, as to what is the relation between orderly natural events and intelligent efficient cause, or Divine agency. In respect to which, we have only to adopt Professor Bowen's own philosophy of causation, — viz. "that the natural no less than the supernatural, the continuance no less than the creation of existence, the origin of an individual as well as the origin of a species or a genus, can be explained only by the direct action of an intelligent cause," — and all special difficulty in harmonizing a theory of the derivation of species with the doctrine of final causes will vanish.

Professor Parsons made a communication upon the general subject. He remarked that: —

The new theory rested wholly on the assumption that the changes or variations by which the author supposed that species were established, were always minute, and effected their purpose only by accumulation through ages. But Mr. Parsons regarded this as wholly unnecessary. The records of monstrosity show that aberrant variation, in the direction of loss or degradation, may go very far indeed. And we have no reason whatever for holding it to be a law, that aberrant variation may not, possibly, in some instances, go equally far in the direction of gain and improvement. Supposing this to be possible, we reconcile the theories of Darwin and Agassiz. Admitting all the new creations which Agassiz requires, the question then occurs, How are these creations created? We must choose, either chance, and chance is a word only and not a thing, or creation at once out of nothing, by creative will; or from earth and water and chemical elements summoned to a proper place, at a proper time, in proper proportions, by the same exertion of Omnipotence. One of these we *must* choose, or else accept the theory that these new creations were created by means of some influence of variation exerted upon the ovum of some existing kindred creature, either before or at conception, or during uterine nutriment. This last supposition Mr. Parsons deemed by far the most reasonable and philosophical. Thus, if we suppose that the time had come for a dog to exist for the first time, and become the father of all dogs, it is far easier to believe that he was born of a wolf, a fox, a hyena, or a jackal, than that he suddenly flashed into exist-

ence out of nothing, or from a few pounds of chemical elements. Mr. Parsons then remarked upon some of the facts in geology that seem to favor this view; particularly the noticeable circumstance, that, as the great classes of animals succeed each other, they are not separated by periods of nothingness, but lap over each other, and are joined by connecting links. By way of illustration, he referred to trilobites, which run up through all the paleozoic rocks; and as they are beginning to thin out, we have in the old red sandstone the *Pterichthys* and the *Cephalaspis*, which was long held to be a trilobite of the genus of *Asaphus*, until Agassiz determined both to be fishes; and Mr. Parsons quoted Murchison's statement, that he regarded them both as the connecting links between the Crustacea and the fishes. So after fishes were well established, we have the *Placodus*, the *Dendrerpeton*, and the *Archegosaurus*, all of which were for some time held by Agassiz to be fishes, but, upon further and final investigation, were determined by him to be reptiles; and these may therefore be regarded as the connecting links between fishes and reptiles,—between marine animals and land animals. So, the line between the Protozoa and the Protophyta is constantly shifting and uncertain. And in the same connection, Mr. Parsons adverted to the singular fact, that man, who begins in the uterus as a nucleated cell, or monad, on his way to birth puts on the traces and characteristic indications of all the great families of animals. Asserting that the time had come when science must either adopt the doctrine of creation out of nothing, or else admit that new creatures may exist as the aberrant offspring of kindred parents, he preferred the latter; nor did he think that reason or religion would be shocked if science should hereafter declare it probable, that the earliest human beings were not called into existence out of nothing, or directly from the dust of the earth, but were children of *Simiæ* nearest in structure to men, and were made, by some influence of variation, to differ from their progenitors in having a brain and general structure such, and so formed, that the breath of immortal life could be breathed into them, and distinguish them for ever from the animals from whom and above whom they had risen.

Professor Bowen replied at length to the arguments and criticisms of Professor Gray, but reserves his remarks for publication in another form.