

A CRITICISM

OF THE

DEVELOPMENT HYPOTHESIS,

AS HELD BY CHARLES DARWIN, THOMAS HENRY HUXLEY, ALFRED RUSSEL WALLACE, HERBERT SPENCER, AND THE NEW SCHOOL OF NATURALISTS.

(WRITTEN EXPRESSLY FOR "JOHNSON'S NATURAL HISTORY.")

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F A C T S .

CHAPTER I.

NO TRANSMUTATION OF SPECIES HAS EVER YET BEEN OBSERVED.

THE question of the origin of species and the source of life is not new. It belongs to the oldest speculations of which we have any record. But it is not antiquated. It excites as eager an interest to-day as it did three thousand years ago. Like the magnetized needle, the human mind vibrates, with perpetual oscillations, under the force of this inquiry.

The problem which it presents has extreme difficulty. The vision which solves it must be both keen and broad. But the sharp and subtle distinctions which, in order to a satisfactory solution, must be clearly seen, some minds do not see at all, or, at the best, most obscurely, while the comprehensive generalizations, which are also and equally requisite, can be grasped but with difficulty by any mind. He who has thought the most upon the question will have the most knowledge of the liabilities to mistake and error, and will be the least dogmatic in propounding his own opinion, or in criticising that of others. But he is not thereby silent, nor without an opinion. While profound meditation upon any theme gives a man humility, it does not render him despondent. He gets courage from his very difficulties. The impulse to seek carries with it the ineradicable conviction that there is a power also to find. While the seeker for truth should be both cautious and candid, he will, if in earnest, be none the less courageous.

It will aid our discussion if we get, at the outset, a clear field. Much dust and fog, by which the vision is very easily rendered both dim and distorted, have gathered over it, and to dispel these, a clear apprehension of some facts is necessary.

Professor Huxley, after having elaborately advocated the Darwinian Hypothesis, nevertheless declares it as his "clear conviction, that as the evidence now stands, it is not absolutely proven that a group of animals, having all the characteristics exhibited by species in nature, has ever been originated by selection, whether artificial or natural."* It is well to keep this fact in mind. The Darwinian Hypothesis, however plausible in its statement or ingenious in its application, is, at the best, only a possible, and wholly wants the evidence which can translate it into the actual explanation of the facts to which it applies. That species vary, and some of them to a great extent, is admitted by all; but in no recorded observation do they cease to be the same species still. The cable which holds a ship to its moorings may be swayed by the waves and still not snap asunder. The moon varies in the time of her revolution around the earth, in her celestial longitude and latitude, in the motion of her nodes and perigee,—and these variations were seriously thought, for a time, to require some new statement for the law

of gravitation, until Clairaut demonstrated that these variations furnished a surprising exemplification of the law. Cuvier has shown,* from Egyptian monuments and mummies, that the animals which lived in that country, in the earliest records of its civilization, are identical in species with those which live there to-day; and Agassiz has shown,† from the coral reefs in Florida, that the animals of the Gulf of Mexico were of the same species 30,000, and probably 200,000 years ago, as in the present time. Though man has been able to secure numerous and often surprising variations within a given species, he has never succeeded in obliterating the original lines of specific distinction, nor in bringing out anything more prominent in their place. An Ancon sheep is no less a sheep, however much its legs may be like an otter's. House pigeons are house pigeons still, whether carriers, or pouters, or fantails, or tumblers. The racer, the dray-horse, the barb has not changed its one specific characteristic, however different these varieties may be. The dog has been associated in close companionship with man from the earliest history, and, more than any other animal, has been subjected to decisive experiments continued through many generations, in order that every possible variation from the original stock might be secured. The result is apparent. The differences of dogs strike the dullest eye. And yet an authority inferior to none declares that "under the extremest mark of variety so superinduced, the naturalist detects the unmistakable generic and specific characters of the *canis familiaris*." ‡ Moreover, the dog himself sees this likeness, notwithstanding the difference. Two dogs of very different varieties treat each other, on meeting, very differently from what either of them would treat or be treated by a wolf or a fox.

The same is the case with all the plants upon which man has made such copious and careful experiment. Not a single instance of one species changing into another has yet been found. The differences have been sufficient to induce some careful naturalists to suppose their possible prolongation into difference of species, and some have thus been led to regard this possibility as though it were already translated into an actual fact. But the fact is still wanting, and however plausible as a conjecture, or however accordant with favorite theories of the universe the Darwinian Hypothesis may be, we must not forget that as long as we lack the first fact in its proof, it is a conjecture alone.

Moreover, these variations, which man has secured by "artificial selection," if we look at them closely, are not favorable to the conjecture, since, in the eye of the scientific zoologist, they can only be regarded as monstrosities, and not one of them would help the individual in that "struggle for existence" upon which Mr. Darwin bases his whole theory of "natural selection." Every one of these variations man has secured for his own advantage, and not for that of the animal. It is no advantage to the wild boar to be changed into the Yorkshire or improved Essex pig. It does not help the sheep at all, in its struggle for existence, that man has been able to change the original stock into Ancons, Bakewells, or Merinos. The effects which man has wrought are, for the most part, differences of size and color; but in nature one part of a living structure is so exactly correlated to all the rest, that an increase in one part must be attended with a sacrifice of some other, and thus what man has gained out of the animal, the animal himself may have lost. Thus man has gained, *e. g.*, in his cattle, an earlier accumulation of meat and fat, but this is counterbalanced in these same cattle by loss of robust health, fertility, and power of yielding milk. These deviations from the typical form and state, instead of being improvements out of which superior species may be gained, are monstrosities only kept up by man's care. The species left to itself sloughs them off. As soon as the introduction of Merino sheep rendered it no longer an object to raise Ancons, the latter variety disappeared, and for years no remnant of it has been seen. § Dogs show a continual tendency to revert to the common type. ¶ Prichard has also shown, ¶ in reference to other domestic animals,—the hog, the horse, the ass, the sheep, the goat, the cow, the cat, and gallinaceous fowls,—originally transported by the Spaniards and others from Europe to this continent, that in instances where they have got out of man's hands, and run wild in the woods, they have lost all the most obvious appearances of domestication, and have approximated to the type which may be supposed to have belonged to the species in its original state. Darwin himself declares that in his pigeons, even with breeds of hundreds of years standing, he was often met by sudden returns in color and other striking appearances to the original type.** The same is true with our cultivated plants. The extended varieties which man has brought out in some of these,—*e. g.*, the cabbage, the turnip, the beet, the potato,—and from which he derives such benefit, are only kept up by constant cultivation. The plant left to itself reverts to its wild, and, to man, its comparatively useless state.

Now, while all these things show that the transmutation of species has not a fact which can prove it, and is at the best but a conjecture, they also render most unlikely the conjecture itself. For in the numberless species which have been minutely observed, over a great space and for a long time, if there were such a tendency to transmutation, how is it possible that no actual case of it has ever been found?

* *Récherches sur les Ossemens Fossiles*, Vol. I., p. 141. —† *Contributions to the Natural History of the United States*, Vol. I., p. 53. —‡ Owen: *Classification of Mammalia*, p. 100. —§ Huxley: *Lay Sermons*, p. 269; *Philosophical Transactions*, 1813, pp. 92, 93. —¶ Prichard: *Natural History of Man*, p. 57. —¶ *Ibid.*, pp. 28-59. —** *Origin of Species*, p. 144. *Variation of Animals and Plants under Domestication*, Vol. I., pp. 240-249.

Why are not cases occurring all the time, and before our eyes? Mr. Darwin admits the force of this inquiry, but we can not yield to the fitness of his reply. He argues that in the struggle for life the improved offspring would exterminate the inferior progenitor, and that thus the old form disappears by the very process of the formation of the new.* But if this be true, and if the process of formation be going on before our eyes, why not that of disappearance also? In many animals the duration of the individual life is so short, and the succession of generations so rapid, that if this process of transmutation were actually at work, how could it fail to have furnished, thus far, a single instance of its accomplished fruits? Mr. Darwin often speaks of the frequent uncertainty of specific and even of generic distinctions, and these are sometimes so obscure that even the great Cuvier ranked the barnacle as a mollusk while it is now classed as an articulate and a crustacean. But this uncertainty and liability to error certainly admits a far other interpretation than what Mr. Darwin adduces. If the species be sometimes separated by such narrow and almost indeterminate bounds, how does it happen that we never see these limits passed over, provided the transition be as easy as is claimed? It is hard to say whether certain living things are representatives of vegetable or animal life. Different naturalists make very different divisions of the innumerable protozoa,—some calling animals what others name plants; but if the distinction between the two be of such little account, why has no member of the one class ever been seen passing over into the other? How is it that such a phenomenon, *e. g.*, as the growth of the highest *alga* into the lowest *zoophyte*,—a phenomenon for which sharp eyes have sought, and which is not only natural but inevitable on the Darwinian Hypothesis, and whose discovery would make the fame of any observer,—has never yet been seen? Mr. Darwin is fond of speaking of those who “curiously illustrate the blindness of preconceived opinion;” is it possible that he has himself furnished the most curious illustration of all, in his method of treating such facts as these?

CHAPTER II.

THE GEOLOGICAL RECORD GIVES NO EVIDENCE OF TRANSMUTATION OF SPECIES.

If one species springs from another by a long-continued process of slow variation and natural selection,—the steps through which a parent has become lost in his descendants are very many; indeed, are practically innumerable. “If my theory be true,” says Mr. Darwin, † “numberless intermediate varieties, linking most closely all the species of the same group together, must assuredly have existed.” Therefore, also, if the theory be true, some evidence of these intermediate varieties must assuredly exist in the geological record. But no such evidence appears. Looking through all the vast cycles of time which geological changes are supposed to imply, we find the same clear distinctions of species as we observe in the historic period. Upon this there is no dispute. Mr. Darwin admits it, ‡ and so do his disciples. § This fact is sufficient to startle, if not to stagger the boldest advocate of the theory. Mr. Darwin acknowledges it to have the gravest force, but its weight is not essentially lessened by his very ingenious attempt to remove it. His explanation rests, in the main, upon the extreme imperfection of the geological record. This record gives us only a few disconnected leaves—and these often well-nigh effaced, and written in a changing dialect—of a great history, in which, if we could only decipher the faded lines, and recover the missing parts, we should find the connections which, it must be acknowledged, we now lack. Sir Charles Lyell adds the weight of his high authority to the same scale. “It is scarcely possible,” says this eminent geologist, “to exaggerate the defectiveness of our archives.” ¶ “In the solid frame-work of the globe, a great part of what remains is inaccessible to man, and even of that fraction which is accessible, nine-tenths are to this day unexplored.” ¶ It might occur to one here to suggest that if this be true, a little more caution would not be amiss in reference to geological inferences generally, and especially in reference to that vast extension of time which Mr. Darwin deems so essential to his hypothesis, and for which he finds the geological record ample. But waiving this, the facts which the palæontologist offers are neither few nor inconsiderable. There are over 30,000 species of animals already discovered in the different formations. How is it, then, that these 30,000 species have been preserved, and are found clearly defined, while not a single individual in a transition state appears? Many of these species are represented in the rocks by thousands of individuals, and if the Darwinian Hypothesis be true, and these individuals are only instances of species growing into and out of one an-

* Origin of Species, p. 155.—† *Ibid.*, p. 161.—‡ *Ibid.*, p. 246.—§ Lyell: Principles of Geology, tenth edition, Vol. II., p. 462.—¶ *Ibid.*, p. 463.—¶ *Ibid.*, Vol. I., p. 306.

other, why are the terminal links of the chain alone preserved? The intermediate links do not differ from these except as would be required by the minutest series of gradations; how, then, if they ever existed, have they now so completely disappeared? The general imperfection of the record is no answer here, for we take the record as it is, and however imperfect, there ought surely to be seen, in the vast number of fossil species actually discovered, some of the missing links, if they ever existed. To Mr. Darwin's explanation of this staggering fact, a German professor has applied the calculus of probabilities, with noticeable results.* If we suppose that of each species a hundred individuals have been found, and that between any two species there were only ten intermediate varieties,—a number much smaller than Mr. Darwin claims,—then the probability against the exclusive appearance of distinct species would be inconceivable millions to one. In exact terms, the probability that out of the millions of fossils which are found, no one should appear from which the process of transmutation could be positively affirmed, is as $1 : 10^{100}$; *i. e.*, the exact probability of the Darwinian Hypothesis, when judged by the actual facts of palæontology, is no more than 1 : 1 with a hundred ciphers annexed!

This calculation may be represented in another way. Suppose in a vast basin (the earth) there were placed many millions of balls (the number of fossils), among which there were ten times more red balls (the intermediate varieties) than blue (the pure species), what is the probability that in drawing one hundred balls (the supposed number of individuals of a species), there would be only blue balls drawn? The result would be as above given.

CHAPTER III.

FARTHER GEOLOGICAL DIFFICULTIES.

BUT this is not the only bar which geology sets in the way of this hypothesis. Some of the lowest and simplest orders of organized beings, *e. g.* the corals, are found among the first forms of life, and also among the latest. But how should this be? In the struggle for existence, they should either tend to develop into something higher or they should not. But in the latter case, the very ground of the hypothesis slips from under it, while in the former, these lower forms ought long since to have disappeared.

The hypothesis would require that, as a rule, the weakest races yield in the "struggle for existence" to the strongest, but the geological fact is exactly the opposite. As a general rule among previous races, those which have succumbed are not the weakest, but the strongest. As a general rule, the present races bear but a feeble comparison, both in size and strength, with those of the past. If we take the gigantic reptiles of the mesozoic period, and ask why they have so entirely disappeared, and why the whole race of reptiles is so evidently on the wane, the reply is not easy on the ground of this hypothesis.

But on the same ground, it would seem as if we should find everywhere a law either of deterioration or development, but the facts are otherwise. Take the class of fishes. It is impossible to affirm that the present offers any fuller or more varied development of the entire class than has before been manifested; nor on the other hand that it has degenerated in regard to numbers, powers, bulk, or range of modification.† The change to which the class has been subjected in the course of geologic time imparts an idea of mutation rather than of development. One consideration, however, seems clear, *viz.*, that those species best adapted to afford mankind wholesome food, such as the cod, the herring, the salmon, the turbot, have greatly predominated at the period immediately preceding and accompanying the advent of man. It is certainly difficult to see what advantages, in the struggle for existence, these possessed above the bony garpikes which they have superseded.

"In the vast physical changes to which the Earth has been subjected since the neozoic epoch, no revolutions seem more sudden nor more pronounced than that connected with the glacial period. Yet the dicyclotherian mammoth lived before it, and passed through the ordeal of all the hard extremes which it involved, bearing his organs of locomotion and digestion all but unchanged."‡ But how was this possible if species are so unstable and susceptible of such transmutation, as the Darwinian Hypothesis claims?

Still farther: if one species has arisen out of another, all the geological facts indicate that this must have been suddenly and not gradually. For the fact proclaimed by palæontology is that species appear suddenly, and disappear suddenly in successive strata. They are as common in the uppermost bed in

* Pfaff: Die Neuesten Forschungen und Theorien auf dem Gebiete der Schöpfungsgeschichte, p. 99.—† Owen: Palæontology, p. 150.—‡ Falconer: Palæontological Memoirs, Vol. II., p. 253.

which they occur as in the lowest or any intermediate bed. They neither increase successively in numbers, nor do they gradually dwindle down; none of the fossil remains, thus far discovered, show signs of a gradual improvement, or of a slow decay.* Moreover, the origination of varieties, so far as we can observe it, is sudden, and not slow. The first Ancon sheep appears to have been as perfect as any of his descendants. Persons have been born with six fingers on each hand, and six toes on each foot, and have propagated this peculiarity to their children, and their children's children, but no cause could be seen in any apparent previous preparation for such a phenomenon. A few years ago there were exhibited two dwarf and idiotic children, as specimens of the race of the ancient "Aztecs;" but these children were found to have been born at San Salvador, dwarfed and of defective brains, of parents who neither in themselves nor in their other children revealed any such deviation from the normal type. It would be easier to argue for a transmutation of species *per saltum*, than by slow growth, through "natural selection."

In the oldest fossiliferous rocks, we find, suddenly appearing, and at the same time, low and also highly organized structures, representing the four great types into which Cuvier has so successfully classified the animal kingdom. Radiates, mollusks, articulates, and vertebrates spring to life simultaneously and suddenly. Below these absolutely no traces of life appear. If it be said that the lower rocks have been subjected to igneous agency, by which organic existences have totally disappeared, which might otherwise have been found, Agassiz has shown † that in the great continent of North America the palæozoic rocks have undergone so little alteration that the remains of the earliest representatives of the animal and vegetable kingdom are as well preserved as in later formations. If it be said that any one of these types has been developed out of the other, Von Baer has shown ‡ the impossibility of this from the facts of their embryonic growth and structure. It requires much more than the affluence of curious facts of another description which Mr. Darwin has collected, and the undoubted skill with which he marshals them, to accredit his hypothesis, in the face of such truths as these.

CHAPTER IV.

NATURAL SELECTION CAN NOT ACCOUNT FOR THE CHANGES WHICH IT IS ASSUMED TO PRODUCE.

It is very difficult to see how that gradual development of organs, which this hypothesis assumes, could have taken place in any such way as Mr. Darwin affirms. If we were presented with a single fact of such development, we should be obliged to assent to it, whether we could explain it or not; but we must remember that not one such fact is furnished, and we must therefore test the doctrine on its intrinsic probabilities. How, then, shall an organ be gradually developed by "natural selection," and in a "struggle for life?" How can the organ give any aid in the struggle for life while it is in a process of formation, and thus how should natural selection have anything to do with its formation? What sort of an agency, *e. g.*, could natural selection have in the formation of mammary glands, and their secretions? How do these help the individual in the struggle for life? According to the hypothesis, every new organ must have been in a process of slow growth through many generations, and, therefore, with numberless individuals which did not need it, and could not use it at all. But the doctrine of natural selection affirms that only those peculiarities which are favorable for the struggle for life would have the advantage to perpetuate themselves; how, then, could organs unformed grow into their perfect form through long-continued generations? The force of this is not weakened by the existence of animals with so-called rudimentary organs. Some insects in deep caves are without eyes: others near the mouth of the cave can see, though indistinctly; while others still, nearly related to these, but living outside the cave, have perfect eyes; § but instead of inferring that there is a progress here by which no eyes have grown into eyes, it is certainly possible, and it is much more credible, that there is a retrogression, where insects with perfect eyes have lost them because placed where they could not see. The continued disuse of an organ is often followed by its loss, and we can easily see the reason for this; but this does not help us at all in conceiving how an organ which does not exist could ever come into existence by any process of natural selection. That which is not, does not become.

Upon this notion of natural selection, the facts of reproduction seem absolutely without meaning.

* Agassiz: Contributions to the Natural History of the United States, Vol. III., p. 91.—† *Ibid.*, Vol. I., p. 25.—‡ Ueber die Entwicklungsgeschichte der Thieren, Vol. I., pp. 160 and 224.—§ Pfaff: Die Neuesten Forschungen u. s. f., p. 113.

It is no advantage to the individual to reproduce its kind. Indeed, with some insects, the individual dies in the act of reproduction. The reproductive, which is one of the most powerful of all impulses, is not for the sake of the individual but for the species. How, then, can "natural selection" have anything to do with it? "If it profit a plant," says Mr. Darwin, "to have its seeds more and more widely disseminated by the wind, I can see no great difficulty in this being effected through natural selection."* But, pray, what profit is it to the individual plant to have its seeds thus disseminated, and how, therefore, should natural selection, which "*can act only through and for the good of each being,*"† effect this? It is the species only that can thus be profited, and hence, if natural selection have any effect, it is for the profit and permanence and not for the origination of species.

Natural selection is thus inadequate to account for the origin of species, since it presupposes the species already formed. The law of heredity, that like begets like, is necessary to give the supposed law of "natural selection" any ground. Now, if we suppose that this law of heredity admits of qualification, which makes its full statement to be, that like begets like "with a tendency to variation," and if we also suppose this tendency to variation extended infinitely,—as the Darwinian Hypothesis demands,—then the law of heredity and the tendency to variation are in flat contradiction. For these two do not depend upon anything outside,—both are grounded in the innermost nature,—and while within a certain range they might exist together, yet their co-existence in an unlimited measure is absurd. We must limit the one or the other; and if it be the law of heredity, then the probability that the traits of a progenitor—including those with which natural selection might have to do—should re-appear in his offspring, is limited in the same degree; and if we apply the limitation to the tendency to variation, then this tendency must stop short of the end which Mr. Darwin requires. There must be a constant, in order to admit of a variation.

"It is conceivable," says Mr. Darwin, "that flying-fish, which now glide far through the air, slightly rising and turning by the aid of their fluttering fins, might have been modified into perfectly winged animals."‡ Such phrases as "it is conceivable," "I see no difficulty in supposing," "I can see no insuperable difficulty in believing," "it seems to me unlikely," etc., are often used by this author to introduce suppositions which he soon employs as though they were actual facts, by which his deductions could be proved. But let us look at this supposition of the flying-fish with the sharp eyes of a naturalist not apt to be led away by his fancy. "Some naturalists," says the great Cuvier, "seeing that more or less use of an organ sometimes increases or diminishes its strength and size, have fancied that habits and outward influences, for a long time continued, might gradually change the form of animals to a degree which would ultimately bring out a difference of species. These writers consider the organized body as a plastic material to be moulded as with the fingers. But the moment they carry out their notion into details, they render themselves a laughing-stock. Whoever should venture seriously to suggest that a fish, by means of a dry habitat, might see its scales disparting into feathers, and itself becoming a bird, would only prove thereby his most profound ignorance of anatomy. What relation is there between the complicated and admirable organization of the feather—so perfectly adapted to the nature of the bird, and a scale that might be conceived as disparting itself? Moreover, a scale is of such a nature that it would not be disparted by drying, and yet this is but a sample of what these boasted writers propose!"§

CHAPTER V.

THE LAW OF HYBRIDITY CONTRADICTS THIS HYPOTHESIS.

MR. DARWIN gives much attention to this law, and adduces many and curious instances to show that interbreeding tends to deterioration, that strength comes from crossing, and that varieties of new vigor, which might develop into new species, may come from individuals of different species. But that interbreeding tends, in certain instances, to deterioration and sterility, may, for aught we know, be a natural consequence of the inheritance of disease, which close interbreeding may perpetuate, and which crossing might tend to remove. Now, no well-authenticated cases of perfectly hybrid animals are known. Mr. Darwin himself admits this, ¶ but argues that such cases are intrinsically possible, because we do know of numberless instances where varieties, when crossed, are not only fertile, but their progeny often surpass in fertility their parents. But the true inference from this is not the one he has drawn.

* Origin of Species, p. 82.—† *Ibid.*, p. 80.—‡ *Ibid.*, p. 163.—§ *Leçons d'Anatomie Comparée*, I., p. 100.—¶ *Origin of Species*, p. 224.

These facts teach us rather the real and ineradicable difference between species and varieties. Moreover, the instances which Mr. Darwin adduces furnish themselves the gravest difficulties to his hypothesis. For if close interbreeding tends to sterility, and if somewhat remoter unions diminish this tendency, and if when these unions are of two varieties the cross breeds are more fertile than either pure stock, and if the difference between varieties and species be only one of degree and not of kind,—how does it happen that when the divergence has passed over just that degree which separates the variety from the species, the whole tendency is instantly reversed, and the mongrel, if produced, is sterile? “He who explains the genesis of species through purely natural agencies should assign a natural cause for this remarkable result, and this Mr. Darwin has not done.”*

CHAPTER VI.

GRADATION SHOULD NOT BE CONFOUNDED WITH PROGRESS, AND DOES NOT IMPLY A DEVELOPMENT.

In the organic world an individual passes through stages of growth, each of which, compared with the preceding, marks a grade of progress. This is the individual's development, in which case, however, it is not, strictly speaking, true to say that the higher has been developed out of or by the lower, for the lower and the higher spring alike from a deeper source. They are both the unfolding of what lay mysteriously folded up in the germ before any manifestation of the individual life had appeared. So the facts teach us, and so a sound philosophy would declare. But though we might look upon gradation here as equivalent to progress, this by no means proves that it is such elsewhere. There is a gradation in the colors of the prism, but it would be absurd to call this a progress in any such sense as though one color had grown out of another. In like manner a gradation of species does not involve a progress of species, and we only confuse ourselves if we confound the two. Because a system of nature can be represented, in the contemplation of which we pass, by regular and successive steps, from the lowest and simplest structure to the highest and most complex, it by no means follows that the higher has proceeded from the lower, or that either has been evolved out of the other. Now, we need to remember that in Natural History no such gradation can yet be represented. There are broad gaps which require prodigious leaps of the imagination to span. Mr. Darwin urges that these gaps are apparent but not real. They seem such only to our defective knowledge. If we had the whole field instead of detached portions before us, we should find, he claims, the gaps filled up, and the gradation perfect. This we may admit. It seems possible, though, as yet, far from being proved. The discovery of the intermediate forms between the Palæotherium and the hooped quadrupeds of to-day, which Cuvier desiderated, may no longer be lacking,† but the proof that the Palæotherium is the progenitor of our present existing hooped quadrupeds, is not advanced one jot by this discovery. Palæotherium and Equus remain just exactly as distantly related as before, notwithstanding all the help toward consanguinity which Paloplotherium, Anchitherium, and Hipparion can furnish. Indeed, the ease with which gradation becomes translated into progress, and the readiness with which this mistake is made to prove the transmutation of species, is somewhat surprising to one who thinks closely. The imagination, not to say the fancy, would seem to have a more prominent part to play in these processes than a faculty of rigorous logic.

In the assignment of the links which are fancied to connect man, through the anthropoid apes, with the orang-outang and gibbon, it is argued that a perfect gradation is a sufficient warrant for the inference that the man has, in process of time, been evolved from the monkey. Now, we should not forget that the postulate here is only a fancy. The gradation is so far from perfect,—indeed, is so grossly imperfect, except in certain superficial characteristics,—that the most accomplished naturalists declare that “man is the sole species of his genus and the sole representative of his order and sub-class.”‡ While the studies of Duvernoy upon the gorilla, and of Gratiolet and Alix upon the chimpanzee, have shown that a monkey of the highest grade is none the less a monkey and none the more a man than one of the lowest,§ Pruner-Bey has also shown that in the most salient characteristics of the two there is an inverse order of development, which not only destroys the gradation but makes it impossible that the higher should

* American Journal of Science and Arts, Vol. XXIX., p. 178.—† Owen: Anatomy of Vertebrates, Vol. III., pp. 791, 792.—‡ Owen: Classification of Mammalia, p. 103.—§ Quatrefages: Rapport sur les Progrès de l'Anthropologie. Paris, 1897, p. 245.

ever have descended from the lower.* And if we pass from anatomical and physiological qualities to the higher psychological distinctions, we find a difference which can not be bridged by degrees, though extended to infinity. Man has a spiritual endowment of which the monkey shows not the slightest trace, and which makes a gradation between the two impossible. "Go over the world," says Plutarch,† "and you will find cities without walls, without letters, without kings, without wealth, without coin, without schools and theatres, but a city without a temple, or an altar, or an order of worship, no man ever saw." But was ever a temple found with the monkey? Has he built altars? Does he worship? Has he written poems, or formed states, or become a subject to laws? Surely these are pertinent inquiries. Surely art, and literature, and civilization, and religion are facts positively bearing upon, and we may say positively decisive of, the question whether the difference between the man and the monkey be one of kind or of degree. In fact, Wallace, who disputes with Darwin the claim to have originated the doctrine of natural selection, expressly excludes man from its operation.‡ If one seek to avoid this conclusion by saying that religion is a relic of superstition from which a higher culture will free us, then we ought to find religion increasing as we descend in the scale, and the monkey to be, therefore, far more religious than man! And yet if all this were true, and the gradation were so perfect that the highest should shade off into the lowest through degrees almost imperceptible, this would not give a particle of proof that any one grade had risen from another. Not only is the premise false, but the inference from it is absurd.

But even if this were not so, and if there are men so sunk in a savage state that the difference between them and the people of the highest civilization seems greater than that which divides some monkeys from others, we have at least just as good reason for saying that the lowest has degenerated from the highest, as that the highest has been developed from the lowest. The history of men is full of instances of deterioration. If we weigh it simply by number, whether of years or of nations or of individuals, degeneration and decay vastly preponderate. Where is the civilization now of Tyre, and Carthage, and Babylon, and Nineveh? and where are the arts which built the Great Pyramid, and Balbec? All over the world we have evidence of a tendency among nations and men to sink away from civilization into barbarism, but history does not show an instance of a nation rising by its own efforts from barbarism to civilization. "To believe," says Mr. Darwin, in his latest book, "that man was aboriginally civilized, and then suffered utter degradation in so many regions, is to take a pitifully low view of human nature."§ But, alas, this is exactly the view which the sad facts of history oblige us to take, and we must square our views of human nature to the actual facts of the case, whether or not it would better suit our desires and our theories to have them otherwise. The dark but incontestable fact is that human nature reveals no inherent impulse to improve or perfect itself. History gives unnumbered cases of a downward tendency, but not a single instance of a self-evolved progress. The lamp which lights one nation in its advancement has been always lighted by a lamp behind it. Civilization is never indigenously; it is an exotic plant wherever found. This is the simple truth of history, which makes all such discussions as Mr. Darwin's respecting the descent of man, as false to fact as they are abhorrent to philosophy.

"By the constant working of his brain," says Carl Vogt, "man gradually emerges from his primitive barbarism."|| But, aside from the crude materialism of which this writer is so fond, and which this sentence might illustrate, it is fair, again we say, to ask for some little evidence that this "constant working of the brain" starts from its own accord. As it is, we have not a particle of such evidence. Writers of the Darwinian school "find no difficulty in conceiving" of it, but the facts to warrant such a supposition are sadly wanting, and one may be pardoned for a feeling akin to amazement that a supposition which is not only unsupported by a single fact, but is contradicted by all the facts of history, should be gravely propounded by serious men. This feeling does not diminish when we remember that it is yet scarcely a dozen years since the school, which is now able to prove not only that man came from a monkey but both these from a mollusk, could hardly conceal its scorn for the attempt to derive the Caucasian and the Negro from a common stock!

* Quatrefages: Rapport, etc., p. 247.—† Advs. Colotem.—‡ Contributions to the Theory of Natural Selection.—§ Descent of Man, Vol. I., p. 176.—|| Lectures on Man, p. 468.

P R I N C I P L E S .

CHAPTER I.

THE AUTHOR OF NATURE.

HOWEVER interesting it may be to study the phenomena of nature, and seek for the facts which bear upon this hypothesis, such a process must always be more or less uncertain, and, in the end, unsatisfying. There is an old poem by Parmenides which proposes to furnish an explanation of being. It relates that the soul, in a winged chariot drawn by flying steeds, repairs to the great throne of Justice for answers to its inquiries. The answers which Justice gives divide the poem into two parts, one of which relates to phenomena and facts, and the consequent opinion of mortals, and the other to truths and principles as immortal Justice herself beholds them. The opinions of mortals resting upon phenomena vary and delude as do the phenomena themselves; but the truth which Justice sees never changes, and the soul which can behold it suffers no illusion. This old poem is not without its instruction for us. There are these two worlds from which we may seek our knowledge, and the convictions which the two can work in the human mind differ just as Parmenides has described them. There is a world of immutable truth which is no product of human opinion, and which does not depend upon the changing phenomena of nature, which is none the less certain though some deny it, and none the less authoritative though all should refuse it their obedience. From this world the deepest thinkers have in all ages looked for light, and have never failed to find it shining, serene and eternal. While the phenomena of nature come and go, and the deductions of science based upon them have proved almost as evanescent as the phenomena themselves, the world of truth abides the same to-day as yesterday, and its light shines clear and changeless forever. Let us see if it can help us on the way before us.

It was a doctrine long ago held by Plato that there could not be any truth if there were no God. Truth, says this greatest of the philosophers, implies thought, and thought implies a thinker; eternal truth implies eternal thought, and eternal thought implies an eternal thinker. No one with a clear discernment of the truth can doubt this. A truth independent of God, a truth which does not imply His absolute being and fullness, is not only impossible, but is in itself a contradiction, and thus no truth but a lie. Truth must be reasonable; but reasonable is that which is conformed to reason, and reason in its highest apprehension must be supreme, eternal, all-sufficient, which is inconceivable as any other than God himself. A process of logic or a deduction of science declares itself an unmeaning babble in so far as it contradicts the Divine existence. Indeed, so irreversible is this truth, so first and last and midst and without end, that the very denial of it necessarily affirms it. For if one denies God's being, his denial is surely worthless unless it rests upon some reason; but this reason must be absolute or it can be no sufficient warrant for his denial, and this will be only to adduce absolute reason to declare that the Absolute Reason can not be, which is the very absurdity of all absurdities. To suppose the existence of some nature of things whose chain of invincible necessity stretches above and around the Deity, is to suppose what, if it have any meaning, must itself be invested with the being and the attributes of the Godhead. Truth is not the creation of God; it is unmade, as are His capabilities; it is eternal, as is His glory; it is to Himself, and to the intelligent spirits who behold it, but the manifestation of what He is and was and is to be from everlasting to everlasting.

The wisdom therefore which the world seeks, or which the world's teachers have endeavored to impart, must be either illumined and vitalized by the conscious acknowledgment of God, or it is meaningless and dead. "I think Thy thoughts after Thee," said the pious Kepler, and in this recognition found his inspiration. No atheistic system of thought has ever been able to stimulate the mind to a profound or protracted search after truth. As a general fact, it is true that the great discoverers in science have been those whose minds were penetrated by a belief in an intelligent Maker of the universe. As a general fact, those without such a conviction who have speculated in science, though they might deal familiarly with known physical truths, and conjecture boldly with regard to the unknown, have not added to the number of solid generalizations.*

God must be the author of nature. He alone is the all-sufficient and supreme, with neither beginning of days nor end of years. The very thought of His being implies His self-existence and eternity. But nature is not independent, and can not be eternal. All that we know of nature are events which

* Whewell: Hist. Induct. Sciences, Vol. II., p. 491.

come out of certain causes on which the events depend. No natural cause is a self-sufficient cause, for from its very *nature* it implies a cause behind it. Only Reason is supreme. Only God can be the self-existent, and all other existence lives and moves and has its being but in Him.

Nature can be no development of God, nor can it develop itself without Him. If nature be conceived as the necessary and eternal evolution of the Divine Being, with whose origination or consummation His free and self-determining will has nothing to do, then is there no explanation for this necessity, and the stupendous process is without a reason or a ground, which is absurd. If we say there is no reason for this evolution, we can not maintain the supposition for a moment; and if we say that there is a reason for it, but beyond our reach, then this reason, if sufficient, must be self-sufficient, and carries us at once to God himself.

We do not avoid this conclusion in the least by taking our thoughts back into some indeterminate past time, and fancying the existence of some chaotic or nebulous material out of which, by slow and infinitely protracted increment, there has grown the order and the vastness of the universe. Such a thought, though often found in modern speculation, is not new. Leucippus and Democritus and Empedocles long ago affirmed it, and it received its refutation from Aristotle, also long ago. It can only be held as a thought by preventing all farther thought. Some minds can forget while talking of æons, and cycles, and vortices, and forces, and chaotic nebula, and fire-mist, that there are questions which need to be answered respecting these. Whence this nebulous fire-mist, and whence its movement and development? If there is motion in the world, says the lynx-eyed Aristotle, there must be a self-mover, else all would come to stagnation.* To say that the world has grown and the movement been gained little by little does not help us in the least, for it is just as difficult to conceive of a beginning without God, of the infinitely little as of the infinitely large. The question is not one of degrees of quantity. A single atom in a point of space can no more be conceived without a creating God, than can the mighty worlds of the teeming universe. The whole doctrine of "persistence of force" is palpably absurd unless it starts with the conception of a self-active Will.

CHAPTER II.

THE RULER OF NATURE.

AND the work which could only be thus begun needs also the same Divine Hand for its continuance and completion. We hear a great deal among the advocates of the Development and Darwinian Hypotheses of what nature and law and derivation and natural selection can do. But what do these terms mean? Suppose we could extract from any one of these authors any clear statement of the precise sense in which he employs them, would he not be obliged to confess that they are only simulacra of science, empty names and shadows with which he has deluded himself and perhaps his readers? Take this term "natural selection," of which Mr. Darwin and the writers who follow him speak as though it were some real potency, some almost living and self-conscious entity which directs the changes of animal and vegetable life. Natural selection must mean either the agency which has produced these changes, or else it must be taken as a collective name for the changes themselves. But if it be taken in the former meaning, how is it, in any conceivable sense, *natural* selection, and how does it differ from the working of a superintending Providence? Or, if we assign it the latter sense, then it can only mean the fortuitous result of innumerable contingencies which have produced and which reproduce themselves, and this is not only most absurd, but is totally destructive of everything like science.

Precisely the same thought may be applied to the term "natural law." What does this mean? It must imply either the power which produces certain effects in nature, or else it is only a generalized statement of those effects themselves. In the latter case, these effects must be either regular or fortuitous. But, if fortuitous, it is idle to talk of them as objects of science; and, if regular, what makes them thus? We may look wise when such a question is propounded, and use many words in our reply, and say that such is the "order of nature," and that this regularity is the exhibition of "natural law,"—but this only brings us back to the very spot from which we started; and we have unconsciously cheated ourselves if we fancy that we have thus made any progress. But if we ascribe to this natural law a real potency back of the effects, and call it the cause of these events, the question at once comes, what is this potency or cause? and whence is it? Do we say that it is *in* nature? But how did it get there? Do

* Metaph. XI., 6-7; IX., 8.

we say that nature has produced it? But through what power or efficiency has nature been able thus to do? These are no idle inquiries. The thoughtful mind can not help making them. Neither will it do for those who ascribe such potency to natural law to ignore them, or to say that they can not be answered because they belong to the field of the unknowable,* for if these questions and their answers are unknowable, then natural law is unknowable, and we have no right to use the term, without confessing that when we use it we have no meaning, and are only talking as the fools talk.

"Our imaginations," says Mr. Herbert Spencer, "must indeed be feeble if we fail to realize in thought the evolution of the most complex organism out of the simplest." † "Our imaginations" can doubtless do many things; they can even run away with our judgments and palm off upon us the wildest vagaries for realities of science; but it is well, if we can, to break loose from their enchantments, and extricate ourselves from the vortices of "evolutions" and "æons" in which they have whirled us, and see how all these performances look in the light of solid fact and to the eye of sober reason. There is not a single fact, then, we must remember, from which these flights of the imagination—more properly termed wanderings of fancy—can take their start. There is not a single instance known where inorganic matter has "evolved" itself into the forms and functions of the organic world. Such instances are only "imagined," they are never found. Chemical analysis may find only carbon, oxygen, hydrogen, and nitrogen in living tissue, but chemical combination can not put these elements together into living tissue again. Something is wanting for such a work, which chemical combination can not reach, and therefore it is not strange that there is something present in living tissue which chemical analysis can not find. Chemical decomposition may take place in the human brain with every act of thought, but to say that this decomposition registers itself in the thought with an exact equivalence of force is a most gross supposition, of which no fact gives us a shadow of proof, and which we have no right to entertain until we have first caught the thought, and subjected it to the same measurements and tests which we apply elsewhere to force.

Now, it may help our imaginations, but it only hoodwinks our judgments, to suppose that time, extended through any number of ages, makes the least difference with this problem. Imagination tires, and language fails to represent the vast ages which the hypothesis of evolution or development postulates. These vast ages may have occurred in the history of our globe,—though it should not be overlooked that the evidence of this when closely scanned is lacking in very essential points,—but an infinite number of ciphers will not make a unit; nothing added to nothing is nothing still, though the process be repeated forever; and ages on ages of evolution and development can never get out of a germ anything more than was originally within it. If we grant for a moment the development theory, the exact problem is to account for that original constitution of things which makes this prodigious process possible and necessary; and when we set ourselves to this problem, the solution is just as difficult if we go back millions and millions of ages as if we turned only to yesterday. We have made the time so vast that we have easily become awed, perhaps appalled, by its contemplation, and have thus been deluded to believe that the difficulty has vanished entirely because removed so far; but we can never account for the origination of matter and force without a Creator, nor for evolution or development without an all-wise and ever-present Providence.

Take nature in any of its aspects, and what can it be, separated from its ever-living and ever-present Author? The word is an easy one for us to use. We may omit to think closely upon it, and vaguely come to attach some notion to it, as though it were an entity with an existence and a power to act of itself. But a single clear, close process of thinking would scatter all this illusion. Nature can no more act of itself than it could be independent of God. For how can it act? Let one closely ponder this inquiry, and he will find that but for God's constant presence and upholding,

"these our actors
Are melted into air, into thin air:
And like the baseless fabric of a vision,
And like an insubstantial pageant faded,
Leave not a rack behind."

That God should be ever present in the work which he has made, giving it continuance and efficiency, is the demand of a sound philosophy no less than of a deep faith. There is no profounder view of nature than that conveyed in Christ's words: "Are not two sparrows sold for a farthing? and one of them shall not fall on the ground without your Father."

* Herbert Spencer: First Principles, Part I.—† Principles of Biology, sec. 118.

CHAPTER III.

DESIGN IN NATURE.

NATURE is constructed according to a plan. This is involved in that it has a rational Author. It would be unreasonable, and thus impossible, for Him to create without a purpose, and as He is ever present with His work, so that the least event is not without His notice, there can be no part of nature, small or great, outside of His design.

There is much criticism nowadays of this doctrine of design. Geoffrey St. Hilaire takes pains to avoid it;* Comte affirms its absurdity;† and Darwin repeatedly urges the impossibility of explaining thereby the facts of natural history. But it is impossible for us to escape this doctrine. The Positive Philosophy and the Darwinian Hypothesis both rest upon it, notwithstanding their denial; for if one says, with Comte, that what is called design is really naught but certain conditions of existence, we at once inquire for the meaning of this word "conditions;" and if one chooses to refer, *e. g.*, all the exquisite and complicated adjustments of the eye, no longer to a purpose or design, but only to the conditions needful to the perfect existence of the eye, we simply go back one step, and ask how can there be such conditions of the eye's existence? or what possible meaning is there in such terms, unless they imply an adaptation or design? Indeed, this very term, "conditions of existence," Cuvier employs in the same sense as Final Causes, and declares it to be a principle of reasoning which zoology employs with advantage. ‡ In like manner, if one says, with Darwin, that there is no permanence in the species or forms of living nature, but only an unceasing development through endless change and progress, we ask whether this development itself be permanent? If not, Mr. Darwin surely could not use it for his purpose; but if it be, then the very ground of his postulate is gone. Still farther: if this law of development be declared as permanent, if it be assumed that the organic world knows no other procedure than this steady evolution through all the ages, the mind at once asks whence comes this procedure, and why? and to these questions there can be no answer, unless we refer it to some fixed purpose and design which the development exhibits. We can ring the changes upon "evolutions," "laws," "conditions of existence," etc., and may delude ourselves with the fancy that the difficulty which is thus hid is thereby removed, but in point of fact it remains the same, under whatever term expressed. The truth of design is an axiom in science which our science is obliged to assume, whether it will or not. It can not be denied without affirming that nature is without order, and is only a jumble of hap-hazard events, and to affirm this is to declare that no science nor knowledge, not even the knowledge of the disorder itself, is possible.

It is curious to notice how old illusions continually reappear, and instructive, also, to recall the old answers by which they have formerly been dispelled. Aristotle found this same notion of our modern naturalists about design in vogue in his day, and a few sentences from his Physical Lectures will show now it looks in the light of keen and penetrating thought. "Some," he says, "reduce all nature to a mechanical principle; if they recognize any other principle at all (as Empedocles spoke of love and hatred, and Anaxagoras of reason), they just touch it and let it drop. They say, it rains, not that the corn may grow, but from a mechanical necessity, because the vapors are cooled as they are drawn up, and being cooled, are compelled to fall again, and, by coincidence, this gives growth to the corn. Why should it not be also by accident and coincidence, they ask, that in the teeth of animals, *e. g.*, the front teeth grow sharp and suitable for cutting, while the hind teeth grow broad and suitable for grinding? Hence their theory is, that whenever blind necessity did not hit by coincidence on results as perfect as if they had been designed, its products perished, while the lucky hits were preserved; and thus Empedocles says that whole races of monsters perished before a perfect man was attained." § Here is an early intimation of the doctrine of "natural selection;" but what treatment did it receive from such a thinker as Aristotle? He says: "It is impossible that this theory can be true; our whole idea of chance and coincidence is something irregular, out of the course of nature, while nature is the regular and the universal. If, then, the products of nature are either according to coincidence or design, it follows that they must be according to design. We see how a house is built, and if that house were made by nature, it would be made in exactly the same way, *i. e.*, with design and according to a regular plan. The same adaptation of means to ends we see in the procedure of animals, which makes some men doubt whether *e. g.*, the spider and the ant do not work by the light of reason or an analogous faculty. In plants, moreover, manifest traces of a fit and wisely planned organization appear. The roots of the plants grow downward, and not upward, for the sake of providing it nourishment in the best way. It is plain, then, that end and design is a cause of natural things." ¶

* Phil. Zool., p. 10.—† Pos. Phil., II., 38; IV., 638.—‡ Regne Animal, p. 6.—§ Nat. Auscult., II., 8.—¶ *Ibid.*

It is no argument against the principle of design in nature that men make frequent mistakes in their application of it. Such mistakes are as often made respecting efficient as respecting final causes, and often made, also, respecting facts and phenomena themselves.

Nor is it an argument against it that there are many facts whose design we do not discover. It is at least as possible that the fault may lie in our lack of discernment as in any absence of design. "It is easy," says Galen, "for men like Asclepiades, when they come to any difficulty, to say that nature has worked to no purpose. But if I were to spend words on such cattle, reasonable men might blame me."* "No one will suppose," says Mr. Darwin, "that the spots on the young blackbird are of any use to this bird;"† but a very little thought would permit any one to suppose that the spots might subserve a very important use. This very peculiarity of color is, in fact, of the greatest use to the young and tender bird, for in its earliest attempts at flight it protects it from the observation of the numerous foes to which it might otherwise easily fall a prey. Moreover, if these spots were of no use to the individual bird itself, they might have ended to subserve to which the individual is only tributary. The rudimentary organs which we often meet, *e. g.*, the teeth in foetal whales, which when grown up have not a tooth in their heads, and the teeth which never cut through the gums in the upper jaws of our unborn calves, the rudiments of mammæ in male animals, etc., may be of service to the individual, which our defective observation has not yet permitted us to learn. It does not become us to deny the uses of these organs until we have a far completer knowledge than our ablest naturalists yet claim of the genesis and development of a single individual structure. And when we see that each individual has ends which reach beyond itself, and is only a thread woven by unseen fingers into a pattern which needed all these individual peculiarities for its completion, we may not dismiss the doctrine of design till we have compassed the comprehensive scheme, and have learned that in its length and breadth and fullness there is no meaning which each individual part, however insignificant, has not aided to express.

Lord Bacon's comparison of the search for final causes to a vestal virgin always barren,‡ is often quoted to show the fruitlessness of seeking for design in nature; but Bacon himself could have meant no such interpretation of his words, for no one ever recognized more clearly a living intelligence in nature. "I had rather believe," he says, "all the fables in the legend and the Talmud and the Alcoran than that this universal frame is without a mind."§ Indeed, no search has been so fruitful in our sciences as that based upon the conviction that there must be a final cause or design for everything. When Harvey noticed that at the outlet of the veins a valve opened toward the heart, and at the rise of the arteries a valve opened from the heart, his conviction that there was a design in this, led him to his great discovery of the circulation of the blood. When Cuvier, who has doubtless contributed to anatomical and biological science far more important truth than it was ever before the privilege of one man to do,¶ studied the bones of fossil elephants, and sought for their designed adaptations, this opened to him, he says, "views wholly new about the theory of the Earth,"‡ and laid the groundwork on which the whole science for Palæontology has been built. Geology, Comparative Anatomy, Physiology, Zoology, Botany, Anthropology, Psychology, indeed the whole range of the sciences, especially those which have aught to do with vital agency, will show abundant fruit from the study of design. The question "why," which the animal never asks, and which the man is always asking, may mean "through what cause?" or "for what end?" and the latter of these inquiries is no less important to science, and no less characteristic of the human mind, than the former.

CHAPTER IV.

SPECIES IN NATURE.

IF now we patiently fix our thought upon this notion of design,—a notion so inevitable and so invaluable,—we shall find that it contains most important truths respecting species and evolution. For what do we mean by a species? Is it a number of individuals grouped together according to any man's fancy? By no means, for the individuals comprised by one man in a species must have a bond of connection which another can recognize, or they are no species. What is this bond? It is not a word simply, for it expresses a real connection of things; it is not a figment of fancy, nor any other product of our own minds, for all men recognize it, and no man can change it in any degree; it is not the product of the individuals thus connected, for it marks out their individuality, and determines their difference from

* De Usu Part., III., 10.—† Origin of Species, p. 382.—‡ De Aug. Scient., III., 4.—§ Essay XVI.—¶ Phil. of Induct. Scient., II., p. 88.—‡ Ossements Fossiles, I., 178.

others, as truly as their agreement among themselves; it is not something made by outward conditions, for different species exist, *e. g.*, the corals in the Red Sea, under absolutely the same conditions.

In the embryonic development of living creatures, they are, up to a certain stage, all apparently alike. No chemical analysis nor microscopic observation can detect the slightest difference in substance or in form. Up to a certain stage no human eye can foresee into what animated structure a given embryo shall grow. What causes the stupendous differences which by-and-by appear? These differences are not made by the individual in which they are represented, for they make him. That by which, *e. g.*, a horse is a horse and not an ass or a zebra, is this very bond or species, whatever this may be. Call it what we will, explain it as we may, here is assuredly a potency, unseen yet mighty, which is able to produce the infinite differences which the organic world reveals. These differences are not accidental; they can not have come by chance,—no mind can entertain such a thought. What, then, is their cause? To say that they result from the law of heredity, the law that like begets like, does not answer the question in the least. It only announces the field in which these differences appear, but does not in any degree account for them. To say that they come from an evolution in which the homogeneous is transformed into the heterogeneous* serves no better purpose, for at the farthest this only tells us the manner in which the differences are disclosed to us, but gives us not a word toward their explanation. The Positive Philosophy affirms that there are no causes for things, and in this it has a shadow of consistence with itself; but it is surprising that writers who resent the implication of belonging to that school,† and who are not only willing to speak of causes, but who regard these as the proper object of scientific search,‡ should delude themselves with the notion that they have explained a given phenomenon when they have only associated it with some others of the same sort, or that they have assigned a cause for a fact, when they have only shown the time, the space, or the manner in which the fact is revealed.

We come back, then, to our question and affirm that, whatever our explanation of it may be, the species is the proximate cause of those differences and agreements we are desired to explain. By the species alone these are as truly constituted as they are denoted. A certain number of individuals, *e. g.*, all the horses which exist, do not constitute the species, horse; they only reveal the species, and this may be done by some as well as by all. The species is not made by the individuals in which it is revealed, but they are, rather, its own product, called into being by its living efficiency, and stamped irreversibly with its image and likeness. The individuals reveal the species, and when this is done, their work is done, and they cease to be. They are not for their own sake, but only for that of the species. All through the organic world the perfection of the individual is not only secondary, but may stand in an inverse ratio to the preservation of the species. The parts of an individual organism may have their copious and well-adapted use for the individual himself, but this does not sufficiently explain them. Even those which seem most full of curious contrivances for the advantage of the one that possesses them, seem also to point to some ulterior design, and the rudimentary organs so frequently found,—while we can not say that they are useless to the individual,—have their chief significance in reference to the species. The species shows the true design of the individuals it has produced.

What, then, is the species? These are its effects, its products; what is this potent cause? The word itself means, literally, something seen,—*e. g.*, a shape, an outline, a form, an image. It is that denoted when we give a name to an object, as horse, dog, etc. The name, as its derivation—*nomen, nomenclon*—implies, expresses literally that which is known; but an object is not known, *i. e.*, can not be named, as an individual. The individual comes before us only as a phantasm, without reality, until its real being is disclosed in its species. The meaning of the word, as something seen, is therefore not accidental. The real thing seen,—*i. e.*, seen by the rational eye, as the man sees, and not as the brute,—is not the individual thing; the only object known is the species, as the name expresses.

But though we thus approach, we do not yet reach the definition of species. We can see, however, from the points thus mentioned, that it is not anything material, nor aught which our senses grasp, though we should not thereby judge that it has no meaning, or that its meaning is beyond our reach. No senses discern gravitation, but the worlds obey it in silence. The laws of property are not material,—are, in reality, naught but refined abstractions, yet by them all the material interests of men are controlled. A species, though not material, and though incapable of discernment by the senses, may be, on this very account, all the more real and potent. For spirit rules the world. Reason is alone supreme. And if species have in them somewhat spiritual or belonging to reason, they are thereby both substantial and mighty.

What, then, is this rational and potent element in species? We come closer to its meaning when we call it an idea. But by this we do not refer merely to an operation of our minds; we take the word

* Herbert Spencer: First Principles, p. 149.—† *Ibid.*: Reasons for Dissenting from the Philosophy of M. Comte.—‡ *Ibid.*: Biology, Vol. I., p. 332.

in its deeper and more original sense, whereby is meant not something contained in our thought, but that which is the very cause and condition of all correct thought. The word, idea, has the same root as wit and wise and wisdom, and is, literally—the same as species—that which is seen. In this view,—which, we should remember, is the original and literal sense of the word,—an idea is that, the sight of which alone is wisdom. But this is something more than the facts and phenomena of nature, however accurately or extensively these may be attained. Our knowledge of nature is properly wisdom only when we pass beyond these facts and phenomena to those living principles in the light of which nature must have been formed, and by which alone it can be truly discerned and explained. If we term these living principles ideas, they are not, properly speaking, made or formed by us. We find them, and behold them, and while they can not be changed by all our thinking, they have a potency which determines how the thinking itself should be. But this potency is theirs, not as separate from reason, not as independent of God, for they can not be conceived apart from Creative Reason and Divine Will. They show the eternal capabilities of Creative Reason, and His contemplation of them is the wisdom which He “possessed in the beginning of His way, before His works of old;” which “was set up from everlasting, from the beginning, or ever the earth was;” and by which, “He prepared the heavens,” and “set a compass upon the face of the depth,” and “established the clouds above,” and “strengthened the fountains of the deep,” and “gave to the sea his decree, that the waters should not pass his commandment,” and “appointed the foundations of the earth,” and which “was daily His delight.” His creation is only worthy of Him as it conforms to His eternal wisdom. He has made it because it was reasonable for Him thus to do, and He has made it as it is, because its archetypal pattern was ever before Him in His eternal capabilities, which, though not His products, are yet, as His original powers, determinative of how all His products must be.

We might call the species, then, which we find in nature, the ideas of the Divine Mind, or we may help ourselves still farther by a word which Plato employs, and call the species with him a *paradigm*, as we speak of the paradigm of a verb, etc., by which we mean, not the law which regulates the form and structure of every part, but the light in which the true position and relations of all the parts are shown.*

But while in all this the conception of species in the organic world has its true ground, we still lack the light which shows the difference between it and all other ideas in nature. Elsewhere in nature ideas are seen as the patterns or types according to which nature is made; as the paradigms in whose revealing nature is truly disclosed; as the principles in which nature has its first ground and last explanation. All this may be true, and yet creation remain only as a passive mirror, in which these patterns and paradigms and principles are reflected. But much more than this is found in living nature. Here there is not only a reflection of ideas, but a participation in them. In a living organism, we see a reciprocity of parts, wherein each is at the same time the means and the end of all the rest, a relation not elsewhere found in nature. Here is that which comes closer home to reason; which not only reveals reason, but in all its parts possesses it as instinct or intelligence.

Here, then, is the peculiar field of species. Species belong to life, and are only obscurely shadowed forth in inorganic nature. Life is an activity which can reproduce and perpetuate itself, and a species is the living paradigm or pattern which directs this power of self-perpetuation. It is not an artificial, outside mould, into which certain individuals, as so much plastic matter, are run and shaped. A species is the inner and living efficiency which makes the organic form and structure what it is, and which determines how all its functions shall be performed; but it has this potency only as it is the seminal and germinating word in which Creative Reason speaks and it is done, and commands, and it stands fast forever. Each species is a separate word, or, if we might thus express it, a separate and distinguishable utterance of the one Universal Word. And as in “the day that the Lord God made the earth and the heavens,” this, His living word, was sufficient to bring forth out of the earth, “grass and herb, yielding seed after HIS KIND, and the tree yielding fruit whose seed is in itself after his kind,” and out of the waters every living creature “that moveth therein after their kind, and every winged fowl after his kind,” and also to make “the beast of the earth after his kind, and cattle after their kind, and everything that creepeth upon the earth after his kind,” so is it adequate still, and so is it necessary still, wherever there is production or reproduction in living nature. An individual can neither produce nor reproduce itself. The distinction of sex runs all through the organic world, making two individuals necessary instruments for the reproduction of a third, but the offspring is not, in its individuality, the reproduction of either parent, nor of both. As an individual, it is other and distinct from its parents, and both the productive and reproductive power is in the species alone. This is the one permanent identity which makes the individuals, and can not, therefore, be made by them; which determines in all the results in natural selection, and therefore can not be determined by that; which was before the

* *παράδειγμα*, from *παράδεικνυμι*, to show.

individuals appeared, and which is, though they no longer are. This spermatic word is the true species, and is also the informing design of the individuals which it has produced, and in which its energizing utterance finds expression. But the design of the species may be seen in some more comprehensive end. There may be in species gradations or successions whereon we mount from lower stages which prefigure higher, to higher stages which explain them, but the ultimate design of all must be in the Creator himself. He must be the final cause as truly as the efficient cause, the end as well as the beginning, the finisher no less than the author of all things.

And now we are permitted to see that all things in nature point in this direction. There are such stages in which the lower prefigures, though it does not produce the higher, and the higher continually contains the lower, while it also symbolizes something still beyond it. The elements of matter may be prepared for, but do not of themselves produce chemical combination, for this combination being always between unlike substances, involves a relation of the one substance or element to the other, *i. e.*, to its related opposite, which relation involves a creative thought and a creative purpose. In like manner chemical combination may be needful, but not sufficient for crystallization, since crystallization implies regularity of form, and this also implies a thought and purpose beyond what the elective affinities of chemical elements contain. So, also, both crystalline and chemical forces may be needful for the plant, and may faintly symbolize the lower forms of vegetative life, but these forces must be powerless to produce a single plant, for the plant has reproduction and is an organism, and this again is inconceivable without a creative thought and purpose for it. Still farther: while the living agency in vegetation may show dim shadows of the animated world, no vegetation could produce a single animated structure, for the animal, besides its self-motion, has sensation; and if in the lowest grades of living things it be sometimes hard to tell whether a given individual be animal or plant, this is not because we do not recognize the broad difference between the two, but only because our observation is here too limited to detect it. So, also, man partakes of a nature kindred to that of the brutes around him. He eats and drinks and sleeps, he lives and breathes, he has sensation, and can reproduce his kind, as truly as the bird or beast or creeping thing. They prophesy of him. They are mute glimpses through the twilight of his approaching dawn. But they do not contain him, though they may be said to reappear in him elevated and in a degree transformed. He is conscious of himself. They act according to a reason which is within them, but of which they do not know. He acts for a reason which he knows, and in which he has a true self-possession. They, with all nature, depend upon their Divine Author,—“He openeth His hand and supplieth the wants of every living thing;”—but man knows the Hand which feeds and keeps him, and can adore and worship. Man is thus not simply the creature, he is the child of God; nature could not produce him, for he is above nature, and nature finds its end and its explanation in serving this son of its Lord and King, and in furnishing the theatre for his exercise and his education. And yet man, though made a little lower than the angels, and crowned with glory and honor, is not worthy himself to be the crowning work of his Maker. In the human form and spirit are rudiments which prefigure a higher coming, in which all that has preceded shall have its completeness, and the Divine work its all-sufficient consummation. When God is manifested in the flesh, when the Son of God, the God-man, appears, and all the forces of nature are seen subject to His unhindered will, when man is brought into fellowship with Him, and is made His vicegerent over nature, and is raised to sit with Him far above all principalities and powers, then is the meaning of nature and of history all explained, the design which has run through the mighty scheme is completely unfolded, and the soul which sees this transcendent vision will also hear the everlasting anthem from “every creature which is in the heaven and on the earth and under the earth, and such as are in the sea and all that is in them.” The whole creation waiteth, we are told, for the manifestation of the sons of God.

LATEST STATE OF THE QUESTION.

In 1860, a few months after the first publication in this country of the *Origin of Species*, I wrote the following notice of the book, which appeared in the *N. Y. World* at the time:

“Mr. Darwin holds in this book not only that all the individuals of a species must have originally sprung from the same place and the same pair, but also that species themselves have no original and permanent diversity. There was but one parent stock for many—perhaps for all. What we now call diversity of species only indicates in one a wider growth, or an earlier divergence from the original source, than in another. The means by which this real difference of degree has grown into this apparent difference of kind is wholly a natural one. The rapidity with which all organic beings tend to increase must inevitably bring different individuals into a struggle for existence in which those will triumph who are most favored by their own powers and surrounding

influences. An individual possessing a peculiarity advantageous to itself will make use of this for its own preservation, and the strong principle of inheritance will tend to produce offspring similarly characterized. Variations may thus not only arise, but be perpetuated and increased with increasing struggles, until they shall widen into divergences apparently quite irreconcilable. This principle of preservation Mr. Darwin terms natural selection, by means of which existing races may have been derived from one. The present book attempts to show that this is both a possible and probable explanation of the origin of species.

"It must be confessed that this doctrine possesses a rare fascination. The highest conceivable unity of cause for the greatest possible variety of effects is what the scientific impulse instinctively seeks. That rational gladness which comes from the harmony of some discovered truth with our true ideal is most complete when the truth we have found is most comprehensive. The all-embracing principle that every stream of nature springs from one original source satisfies the deepest craving of our intellectual being. And, having found the one supreme cause, the more fully we can trace complicated results to simple agencies, the more clearly do we recognize the glory of the Author of all. The wisdom which could secure that the same sunlight should melt the wax and harden the clay, and cover nature with its varieties of color, and enter as a necessary element into the substance and the structure of every living thing, is certainly more apparent than that which could only secure these different ends through as many separate means. The first statement of Mr. Darwin's theory would therefore be attractive to a reverent and thoughtful mind. It will also be an argument in its favor with some that the facts and reasonings which he adduces in support of his main doctrine obviate the objections urged against the unity of origin of the human species. Obviously, if a bird and a beast might in some far-distant past have had the same parentage, a Caucasian and a Negro may have sprung from one stock at a period far less remote.

"But the doctrine is not without difficulties. If facts do not contradict it, no fact as yet discovered proves it. Nowhere have we any evidence that one species has ever been transmuted into another. In all the geological periods the lines between species seem as strongly marked as now. Moreover, among previous races those which have succumbed in the 'struggle for life' are not the weakest, but the strongest. As a general rule, the present races bear but a feeble comparison, both in point of size and strength, with those of the past. If we take the gigantic reptiles of the Mesozoic period and ask why they have so entirely passed away, and why the whole race of reptiles is so evidently on the wane, it might seem difficult to reply on the ground of this book. These points are frequently urged as objections to the doctrine. But, though Mr. Darwin nowhere alludes to them, we can imagine that his reply would be something as follows: The difficulty encountered by any individual in the struggle for life is in many respects proportioned to its bulk. If, *e. g.*, a dry season be prolonged, the bulky mammal will suffer from the drought sooner than the smaller one; while, if new enemies are introduced, the large and conspicuous animal will fall a prey, while the smaller kind will conceal themselves and escape. This would be plausible. Perhaps it is sufficient. But then why should not the same hold true of all races? Why should we not find everywhere a law either of deterioration or development? Certainly we do not. Take, *e. g.*, the class of fishes. According to Prof. Owen, it is impossible to affirm that the present offers any fuller or more varied development of the entire class than has before been manifested, nor, on the other hand, that it has degenerated in regard to number, bulk, powers, or range of modification. The change to which the class has been subjected in the course of geologic time imports an idea of mutation rather than of development. One conclusion, however, is quite clear—*viz.* that those species best adapted to afford mankind wholesome food, such as the cod, the herring, the salmon, the turbot, have greatly predominated at the period immediately preceding and accompanying the advent of man. It is certainly difficult to see what advantages for self-preservation these possessed above the bony garpikes which they have superseded.

"The introduction so recently of the human species, without any intermediate links remaining of its original connection with the lower animal races, is a sufficient evidence that man at least had a distinct and separate origin. We say 'recently,' for the discovery of the flints in the Postpliocene at Abbéville and Amiens does not disprove the commonly-received opinion. But a philosopher, on Mr. Darwin's grounds, might affirm, and truly, that the distinction between man and brute is one of kind, and not simply of degree, and therefore we might anticipate a different law for the origin of the two. That the human species was introduced by a separate creation does not, therefore, disprove the argument for the natural origin of the different species of the animal world.

"The present book is an abstract of a larger work, subsequently to appear, which shall more fully present the premises from which these conclusions are drawn. It is very concisely written, and cannot be read without close attention. It bears the marks of great candor on every page."

Some twelve years after the foregoing notice was written, the *Criticism of the Development Hypothesis* was prepared for Johnson's *Natural History* at the instance of the publisher, who now (1888) requests me to add a brief statement of the case as it stands at the present day. I do not need to modify anything I have previously written upon this subject, so far as the laying down of principles is concerned. Principles do not change, and any conclusion based upon their clear apprehension abides for ever. But it is not thus with what we call "facts;" these are subject to constant mutability. The so-called facts of one age often become the fictions of another. Few facts of science long stand the test of time. Advancing observation changes the point of view, sets things in a different light, and introduces new discoveries which constantly modify the old.

Since the *Criticism of the Development Hypothesis* was written, more instances than were then known have appeared where closely-related species have been found capable of reproduction—*e. g.* the dog, the wolf, the jackal, and even the spitz-dog and the fox. The botanists now affirm quite generally that the possibilities of hybridism are incapable of limitation in the plant world. Certain cases have also been adduced where varieties seem to have developed into clearly-marked species—*e. g.* the Paraguayan cat and the Porto-Santo rabbit. Intermediate forms have also been so abundantly found, and with such wide variations among some groups—*e. g.* the sponges and the Foraminifera—that it is said we can hardly speak of species here, but only of centres and lines of variation. Zoologists would now generally dissent from the statement, from Owen, quoted in the *Criticism*, that the dog is one species. They now declare that dogs differ as much from one another as from wolves or jackals. All these new "facts" should be allowed their full weight in determining the hypothesis. I think it is also a fact that zoologists who at first largely accepted the theory of "natural selection" now largely reject it because of its felt inadequacy.

The Darwinian doctrine—as, indeed, the broader doctrine of evolution, in which it is included—still has the fascination which belonged to it at its first announcement, and this will make a careful thinker cautious in consenting to its conclusion. There is a strong bias in its favor which is capable of profoundly affecting both the scientific man and the theologian, each of whom is liable to find himself unconsciously drawn to its acceptance. This makes it advantageous to set before ourselves some principles concerning the doctrine, and also certain facts which every one will, if he is wise, consider.

I.

It should be clearly stated at the outset, and carefully kept in mind, that evolution, at the farthest, is only a process and in no sense a power. It affirms as a fact a certain course of nature, and has nothing to say of the cause of its origin or its continuance. We altogether delude ourselves, therefore, when we talk of what evolution does or can do. Evolution neither does nor can do anything. Given all its range, it is only a word by which we state what has been done, and to call it the cause of the doing is simply the absurdity of calling any doing its own cause. This is so obvious that probably it would be acknowledged by all, and yet many persons, quite unwittingly deluding themselves with what Bacon calls the "idols of the market,"¹ speak of evolution as though it were some entity possessing a power to produce the manifold phenomena which at the farthest are only the forms in which it appears. If the growth of a tree is its evolution, nothing is gained in fact, and much may be lost in thought, by treating the evolution as though it were the cause or in any sense the explanation of the growth. The growth *is* the evolution, and nothing is explained thereby.

II.

A creator and a creation are the necessary postulates to any evolution. That matter or its motion should be self-originated is a contradiction in terms, and, in whatever guise it may be clothed, must be in the future, as it has been in the past, renounced by every careful thinker. Evolution finds its only explication in creation. Not only is an intelligent Author and Ruler of nature the simplest and most satisfactory solution to the whole problem of nature, but no close and comprehensive thinking on any theme is possible without the thought of Him. Instead of there being any conflict between science and religion, the knowledge of nature rests upon, and is both enlightened and vivified by, the knowledge of God.

III.

The doctrine of the mutability of species finds no analogy in the facts of the inorganic world. The inorganic elements never change. No environment, no lapse of time, no change of place, modifies these, so far as yet discovered, in the slightest degree. Hydrogen is hydrogen anywhere

¹ *Novum Organum*, I. ii. 6.

and everywhere. We find it with the carbon of the coal-beds, where it has been buried in the earth for countless ages; we find it in meteoric iron as it comes from the illimitable celestial spaces and times; we find it flaming up in the corona of the sun; we find it in the water, in the air, and in unnumbered combinations all around us; but it is hydrogen all the same. It is never anything other than itself; it never shows the slightest tendency to variation. The same is true of all the other elements of the inorganic world. They never pass into one another, and never lose or gain anything which changes their original constitution in the slightest degree. This fact is exceedingly impressive. It points resistlessly to a Maker and Ruler of these elements other than themselves, and is an indication, also, of what might be anticipated in the higher world of living nature. If these lifeless elements of the inorganic world are so invariable, it will not surprise us if we find also in organic forms constant types, patterns of wisdom, which, being always wise, are always changeless. It would surprise us if this were not the case.

IV.

The profoundest and most wide-reaching fact in the organic world is the fact of sex, and this the Darwinian hypothesis quite fails to explain. If the organs of a given individual are developed according to that individual's need, and are gained only because they give strength in the struggle for existence, how should there ever be organs of sex? How do these supply any individual need or favor the struggle for existence? In unnumbered instances the sex-distinction, instead of favoring an individual's life, is directly fatal to it; for myriads of the insect world die in the act of reproduction, and in no case does the distinction of sex—all-important as it is to the species—give to the individual, *as individual*, any strength or help. I have carefully noted the explanations offered on Darwinian grounds to this wonderful phenomenon, but fail to find any abatement to the force of this objection. The facts of sex and of reproduction, while in beautiful accord with the doctrine of the permanence of species and in perfect harmony with the story of creation, seem to-day as strongly at variance as ever with the Darwinian hypothesis.

V.

The facts of human life and of human history require another explanation than that of development or evolution. A profound student here is obliged to take cognizance of facts which no mechanical force nor accidental relations can explain. The facts of sin, of religion, of duty, of art, of politics, of philosophy, indicate a factor in the human life totally different from anything found in the animal world. I know that the facts of what may be called "animal psychology" are exceedingly obscure, and he who has studied them most profoundly is likely to be least dogmatic in his affirmations concerning them; but, while I was formerly inclined to speak of animal intelligence and to think the brute capable of some sort of reasoning, and while I must acknowledge still that one who takes this ground may point to many facts in his support, I find myself more and more dissatisfied with it and more and more led to regard the phenomena of animal life as instinctive wholly and not at all intelligent. But, however this may be—whether an animal has or has not the power of judging and inferring, differing only in degree from that which man possesses—the more carefully one studies all the facts of the animal and the human world, the more clearly does he discover a difference of kind between these two which no hypothesis of development or evolution is able to bridge. The likenesses to religion, to morality, to art, to government, which some men suppose themselves to have found in the animal world are superficial wholly and disappear to a careful scrutiny, while the evolution of these, among the more advanced races of men, from lower stages of human life, is not only unsupported by facts, but is in exact contradiction to the facts of human history. Instead of religion, *e. g.*, being the outgrowth of superstition, and the habit of worship the result of dreams or of phantasms, the facts, so far as yet disclosed, show a more prominent law of religious deterioration than of development, the earliest religious notions of any people, where they can be traced, being much higher than the later ones, excepting as these have been elevated and enlarged by outside instruction. As I have said in the previous criticism, no people have ever been known to civilize themselves. No savage tribe has ever in historic times taken steps toward its own civilization; and to suppose that a different law prevailed in prehistoric ages from what we find to be the case, without a single exception, wherever we can trace the record, is to take a ground quite foreign to the true spirit of science. The profoundest law of history is still furnished us in the first chapter of the Epistle to the Romans, and the Bible is still—as ever since it was written—the teacher whose wisdom does not fail.

VI.

The most important fact yet occurring in human history, as probably no one would now deny.

is the appearance of Jesus Christ among men. No other fact is comparable to this in the power it has already exercised and the prominence clearly indicated for it in the future of human affairs. But how is this fact to be explained? Environment, antecedent conditions of race, laws of heredity, of evolution, of development, given their utmost stretch, fail to embrace it. I believe that he who ponders this fact deeply, putting aside all preconceptions and taking the fact alone in those elements of it which are clear and indisputable, will be resistlessly drawn to the conclusion that it stands alone and requires quite another explanation from the ordinary lives and deeds of men. Whatever may be held regarding the miracles which Jesus Christ may be said to have done, that He himself is a miracle challenges every denial.

Delivering ourselves, therefore, as far as we may, from the bias to which the evolutionary hypothesis naturally inclines us, we must reach the verdict that it fails as yet to furnish any all-embracing law for the facts either of nature or of history. We must still kindle our torches at the sun.

AMHERST COLLEGE, September, 1888.

