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I.

ON THE ORIGIN OF SPECIES.

On the Origin of Species by Means of Natural Selection; or, the Preservation of Favoured Races in the Struggle for Life. By CHARLES DARWIN, M.A., F.R.S., F.L.S., &c.

MR. DARWIN, as a naturalist, is eminent amongst the eminent—an authority amongst authorities—*laudatur à laudatis.* Probably few men are better entitled by patient observation, and careful analysis of facts, to construct a theory. He has been in no undue haste to do this. Perhaps it may be above a quarter of a century since, in the capacity of naturalist on board H.M.S. *Beagle,* he was impressed with certain facts connected with the geography and palæontology of South America, which appeared to throw "some light on the Origin of Species—that mystery of mysteries, as it has been called by one of our greatest philosophers."* After five years had elapsed in accumulating observations and reflecting upon them, he allowed himself to speculate, and drew up some short notes, which in 1844 were enlarged into a sketch of certain conclusions, which then seemed probable. Since that time he has been constantly engaged in the same investigations; and the present work, which is but an abstract of a much larger one promised in two or three years, contains the result.

The fact that this is but an abstract, containing the conclusions only which have been arrived at by examination of vast masses of detail, the barest outline of which only is given, makes the task of the critic difficult, and in some respects vague. "No one (says the author) can feel more sensible than I do of the necessity of hereafter publishing in detail all the facts, with references on which my conclusions have been grounded; and I hope in a future work to do this. For I am well aware that

* Introduction, p. 1.

scarcely a single point is discussed in this volume on which facts cannot be adduced, often apparently leading to conclusions directly opposite to those at which I have arrived. A fair result can be obtained only by fully stating and balancing the facts and arguments on both sides of each question; and this cannot possibly be here done."*

We think it in many respects unfortunate that a theory of such importance as the one in question—one intended to produce so complete a "revolution in natural history"—should have been published in apparent haste, and without the fullest illustrations possible, and the most complete provisions against misapprehension. It is doubtless due to this cause that many errors as to fact, many hasty receptions of authority, many palpable contradictions in the argument, to which we must hereafter refer, have crept into the work. Such as it is, however, it has produced a very considerable sensation in the scientific world,† and both on this account, and because of its own intrinsic merits in regard to the learning and research therein displayed, claims, even from its opponents, the most careful and respectful consideration. We propose, therefore, to indicate, as fully as our limits will permit, the nature of Mr. Darwin's theory, and the reasoning by which it is supported; and afterwards to inquire whether such a theory be required by, and how it is accordant with, existing phenomena.

A casual survey of the vegetable and animal world exhibits to the inquirer an infinite number of forms, having almost every conceivable variety of general aspect and attribute; whilst a closer investigation shows certain relationships of type and function to subsist amongst certain members. Individuals are closely grouped together with such identity of structure, and such con-

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* Introduction, p. 2.

† At the last meeting of the British Association, Sir Charles Lyell thus spoke of the work and its author :—

"Among the problems of high theoretical interest which the recent progress of geology and natural history has brought into notice, no one is more prominent, and at the same time more obscure, than that relating to the Origin of Species. On this difficult and mysterious subject a work will very shortly appear, by Mr. Charles Darwin, the result of twenty years of observation and experiments in zoology, botany, and geology, by which he has been led to the conclusion that those powers of nature which give rise to races and permanent varieties in animals and plants are the same as those which in much longer periods produce species, and in a still longer series of ages give rise to differences of generic rank. He appears to me to have succeeded, by his investigations and reasonings, to have thrown a flood of light on many classes of phenomena connected with the affinities, geographical distribution, and geological succession of organic beings, for which no other hypothesis has been able, or has even attempted, to account."

stancy of character derived from parent to offspring, as to be ranked as species. Various species present such analogies one to the other as to be classed, under more extended heads, as *genera*. Genera, again, that are allied by certain affinities, are united to form natural orders; and these are grouped again, according to such general characters as they may possess in common, into classes and sub-kingdoms. Thus all the varieties of our domestic dog or cat are so alike in essential structure, that they are respectively considered as distinct *species*. But the dog has many points of resemblance to the wolf, the dingo, &c.; and the cat has similar relations to the lion, tiger, and puma. The allies of the dog are therefore united to form a *family*, called *Canis;* and those of the cat are similarly united into the family *Felis*. But the *Canidæ* and the *Felidæ* are again allied by important points of structure, food, and habits to each other, and to the bears (*Ursidæ*), martens (*Mustelidæ*), and seals (*Phocidæ*); and these families are aggregated to constitute the natural order of the CARNIVORA. These form one of the great divisions of the class MAMMALIA—a section of the great sub-kingdom of the VERTEBRATA.

It is with regard to the nature and reality of these divisions that naturalists differ. The great majority have been in the habit of considering that species alone had an existence in nature, and that a family, a genus, or a class was simply an *ens rationis*, a mental classification for convenience only; that only the members of a species had any natural relationship which they derived from one or more pairs of protoplasts, and the properties and attributes of which they inherited unchanged through each successive generation from their first creation; whilst every other species had equally an independent origin, merely grouped into larger and larger collections, in obedience to a law of the Creator, unknown in its nature, though beautiful in its result.

Not so the supporters of the famous "Development" hypothesis, of which Mr. Darwin is the latest, and, probably, the most philosophical exponent. They believe that all the organisms which now live, or have ever lived, upon this earth, are naturally connected by descent—by blood-relationship, so to speak; that "all true classification is genealogical;"* that such characters as the various species of one genus have in common, are thus common to them because they had one common ancestor; and that the affinities in like manner between the genera of an order and the orders of a class are due to an original common parentage. There was originally one form only of organization; and this, during the lapse of countless ages, in obedience to an infinite variety of influences,

* Introduction, p. 420.

was gradually modified into a tree, a fish, a bird, an oyster, a mammal, or a man. (We shall shortly show by quotation that we have not overstated the extent to which the theory is carried.) Thus, whilst the former theorists believe in creation, the latter believe only, or chiefly, in development. Not that they entirely exclude a Creator from the universe; he is by some permitted to create the first germs of organic life; but after that, his power is at an end, and the organism is left to struggle itself into development as best it may, in obedience to some "law of progress," to its own endeavours after action,* to casual variation, or to changed conditions of life owing to geological and other revolutions.

Of all the supporters of this theory Oken is by far the boldest, the least doubting, the most uncompromising. He wrote his Treatise on Biology in "a kind of inspiration"†—at least so he tells us; they must, therefore, be daring critics who venture to dissent.

(898‡) Mucus is carbon "mixed identically with water and air."

(900) "Every organic has issued out of mucus."

(901) "*The primary mucus, out of which everything organic has been created, is the sea-mucus.*"

(905) "The sea-mucus, as well as the salt, is produced by the light. *Light shines upon the water, and it is salted. Light shines upon the salted sea, and it lives.*"

(906) "All life is from the sea, none from the Continent."

(912) "The first organic forms, whether plants or animals, emerged from the shallow parts of the sea."

(913) "*Man also is a child of the warm and shallow parts of the sea in the neighbourhood of the land.*"

(930) "The primary organic is a mucus point."

(934) "The first organic points are vesicles."

(958) "No organism has been created of larger size than an infusorial point. No organism is, nor has one ever been, created, which is not microscopic."

(959) "Whatever is larger has not been created, but developed."

(960) "Man has not been created, but developed."

Enough of this; too much, were it not desirable to show to what burlesques upon philosophy even great minds will condescend, rather than admit an ever-active Creator and sustainer of the world; theories, the "inspired" and inflated dogmatism

* See "Lamarck's Phil. Zool.," tom. I., *passim*.

† See Preface to "Physio-philosophy," p. 9, Royal Society's edition.

‡ All these figures refer to the numbered sections in the edition referred to.

of which presents no tangible points for either intelligent acquiescence or dissent.

In the development theory of Lamarck, we meet with something more like reason; facts are not altogether ignored, though evidence is frequently assumed, and more frequently still pressed into service which it cannot accomplish. Small homogeneous gelatinous bodies are the first organic existences; and these are destined in the course of countless ages to be developed into plants, animals, and man. The means by which this great work is to be accomplished are twofold—first, a "tendency to perfection," which we may pass over as not conveying any distinct meaning, and only called in to supplement the requirements of the other; and second, the effect of varying conditions of life, resulting from slow geological changes, causing a change in their wants, and these wants exciting new actions and habits, which in their turn necessitate, and "consequently" produce new organs and new instincts. Of course there is no *evidence* of any such production; but we shall shortly see of how little consequence is the absence of evidence on any such subject.

Having thus assumed the production of new organs, M. Lamarck announces a proposition sufficiently startling, yet coherent enough with the postulate. "It is not the organs, or in other words, the nature and form of the parts of the body of an animal, which have given use to its habits, and its particular faculties; but on the contrary, its habits, its manner of living, and those of its progenitors, have in the course of time determined the form of its body, the number and condition of its organs—in short, the faculties which it enjoys."* Thus web-footed animals were not made web-footed that they might be able to swim; but they became so by their repeated efforts to stretch out their toes in striking the water. The antelope only gained its light and agile form by being obliged to fly frequently before its oppressors; the giraffe acquired its long neck by being compelled to feed off the tops of trees; and the beaver attained its flattened development of tail by using it as a trowel.

The original monad having survived much tribulation through countless ages of transformation, is at least met with in the form of a monkey, most probably the Angola Orang *(Simia Troglodytes,* Linn.*)*, which is said to be "the most perfect of animals." A tribe of these creatures were deprived, through pressure of unknown circumstances, of the necessity (or power) for climbing trees, and hanging by the boughs. They, therefore, adopted the

* "Lyell's Principles of Geology," 9th edit. p. 571.

upright gait, and from being quadrumana, became bimana. In accordance with newly-acquired habits, their snouts became shorter, their incisors vertical, and the facial angle improved. A desire to rule supervened, and they drove out their brother monkeys into the forests, where their development in intelligence would most likely be impeded. Meanwhile they combined themselves in various ways, and invented language, that they might follow up with greater facility their undertakings, and thus they became MAN. Perhaps it is desirable to mention that this sketch is a grave and correct abstract of a theory, which in its original and modified forms, has made from time to time much sensation amongst students of Natural History.

Almost identical in its ultimate results with the great Lamarckian theory, that of Mr. Darwin differs from it widely in the highly philosophical and ingenious views, which are intended to throw light upon the cause of the successive modifications of structure which lead to specific and generic differences amongst organic beings. That they fail, in our opinion, to account for these, is to be ascribed, we believe, to the fact, that a development theory of this nature is too opposed to existing phenomena to be supported by any argument whatever. Mr. Darwin's theory in brief, is this. There is a constant struggle for life going on amongst all living creatures, in which struggle, the "weakest go to the wall," and the strongest, that is, the "favoured races," survive. These favoured races are so favoured in virtue of their having been born (in obedience to chance, or some law, the conditions of which are unknown), with a structure in so far differing from that of their species, as to afford them an advantage, however slight, over their brethren in the said struggle. This is Innate Variability; and when a variation occurs, thus enabling its possessor to survive where others die, there is a prospect of a race being formed with this peculiarity, which, slowly augmenting for thousands of generations, at last gives character to a new species. And the slow accumulation, through countless ages, of similar modifications, by natural selection, forms distinct genera and orders. The same powers which we daily see producing what we call *varieties*, are on this theory capable of producing *species* in larger periods, and in still more extended periods, genera, orders, and classes. Part of this theory we will give in Mr. Darwin's own words:—

"If during the long course of ages, and under varying conditions of life, organic beings vary at all in the several parts of their organization, and I think this cannot be disputed; if there be, owing to the high geometrical ratio of increase of each species, a severe struggle for life at some age, season, or year, and this certainly cannot

be disputed; then, considering the infinite complexity of the relations of all organic beings to each other, and to their conditions of existence, causing an infinite diversity in structure, constitution, and habits, to be advantageous to them, I think it would be a most extraordinary fact if no variation ever had occurred useful to each being's own welfare, in the same manner as so many variations have occurred useful to man. But if variations useful to any organic being do occur, assuredly individuals thus characterised will have the best chance of being preserved in the struggle for life; and from the strong principle of inheritance, they will tend to produce offspring similarly characterised. This principle of preservation I have called, for the sake of brevity, natural selection; and it leads to the improvement of each creature in relation to its organic and inorganic conditions of life."—*Origin of Species,* chap. iv., p. 127.

In the introduction the author gives the summary and application of these principles thus:—"I am fully convinced that species are not immutable; but that those belonging to what are called the same genera are lineal descendants of some other and generally extinct species, in the same manner as the acknowledged varieties of any one species are the descendants of that species. Furthermore, I am convinced that natural selection has been the main, but not exclusive means of modification."

Thus we perceive that there are three essential elements in this theory—variability, struggle for life, and natural selection of the strongest, or most favoured races. The two former are real phenomena, undoubted by any one; and in their discussion Mr. Darwin evinces much learning and skill, and conveys a great amount of most interesting information. Upon each we shall dwell for a short time before inquiring into the reality of natural selection.

Variability.—The offspring, as a rule, is like its parent, but of a likeness more or less modified—not absolute. The form may vary slightly, or the colour, the temperament, or the inherent strength of constitution. The amount of these variations is part of the very essence of the controversy; naturalists in general consider that such variations are bounded by certain limits, which limits are soon reached, and cannot be passed. The progressionists think otherwise—that these variations may increase indefinitely, if favoured by selection either natural or artificial. Variety is most frequent under domestication, but is not confined to that state. Wherever occurring, the causes are so obscure as to defy accurate predication, and variety is generally considered accidental. "Our ignorance (says Mr. Darwin) of the laws of variation is profound. Not in one case out of a hundred can we pretend to assign any reason why this or that part differs, more or less, from the same

part in the parent;"* and again, "variation is a very slow process, and natural selection *can do nothing until favourable variations chance to occur.*"† We wish these points to be specially noticed, because we shall shortly see how much more philosophical it appears to Mr. Darwin and his school to trust in an uncertain chance for existence, than in a principle of adaptive creation. The casual nature of this variation is often dwelt upon by Mr. Darwin, and the little effect that external causes can be supposed to have upon it.

"How much direct effect difference of climate, food, &c., produce upon any being is extremely doubtful. My impression is, that the effect is extremely small in the case of animals, but perhaps rather more in that of plants. . . . .

"Instances could be given of the same variety being produced under conditions of life as different as can well be conceived; and, on the other hand, of different varieties being produced from the same species under the same conditions. . . . .

"Such considerations as these incline me to lay very little weight on the direct action of the conditions of life."—*Origin of Species*, chap. v., pp. 132-4.

But vague, casual, and uncertain, as is this first principle to which the progressionists ascribe the development of gelatinous spherules into vegetables, animals, and ultimately men, can we arrive at nothing more definite as to its effects? We believe that this is possible; and the result is, that so far as direct testimony goes, species only vary within defined limits, and that these limits continue undisturbed for thousands of years at least. The catacombs of Egypt afford the most irrefragable proof that three thousand years ago many of our domestic animals were precisely identical as to specific characters with those of the present day. Amongst these are the dog, the cat, and the bull; species which have certainly been placed under every circumstance that could favour variation. Mr. Darwin, of course, does not overlook this; his answer to it requires a brief notice.

"Even if this latter fact (identity of the species) were found more strictly and generally true than seems to me to be the case, what does it show, but that some of our breeds originated there four or five thousand years ago? But Mr. Horner's researches have rendered it in some degree probable that man sufficiently civilized to have manufactured pottery, existed in the valley of the Nile thirteen or fourteen thousand years ago.‡

To the progressionist, a few thousands or millions of years more

* p. 167. † p. 178. ‡ p. 18.

or less are of no moment; but in this calculation there is a palpable error. Mr. Horner bases his conclusions upon a certain 9 ft. 4 in. of mud sediment over an overthrown statue at Mehahenny, on the site of ancient Memphis. He calculates that this mud has taken 3,215 years to accumulate; and having, from a depth of thirty-nine feet, brought up a piece of pottery, he concludes that this must have been deposited there more than 13,000 years ago. Unfortunately for the theory, this statue is described by an Arab historian, Abdallatiff, as erect and in its place, not more than six centuries ago; so that the necessary periods for accumulation must at least be divided by five.

But to return;—leaving out of the question the abstract possibility of species varying sufficiently to form another and different one, there is a total absence of positive evidence on the subject. The naturalist may reason ingeniously enough to show what *might be;* but if we ask, Did you ever see one species develop into another? or did you ever find one in what you can assert to be a transition stage? They answer honestly, no; but account for this by the shortness of our period for observation. We shall see shortly whether the prolonged geologic periods afford any more conclusive testimony.

Struggle for Existence.—All organic beings have a tendency to multiply in a geometric ratio; and this so rapidly that unless there existed powerful agencies for destruction, the earth would soon be overrun with the progeny of any single pair. The elephant is supposed to breed more slowly than any other known animal, yet at the lowest computation one pair might easily be the ancestors of fifteen millions in five centuries. As to the multiplication of the lower animals, the understanding is baffled in attempting to realise their increase. In five generations, one aphis may be the parent of 5,904,900,000 individuals, and there may be twenty generations in a year. The female flesh-fly will have 20,000 young ones; and in five days any pair of these are qualified to produce as many more; and Linnæus asserts that three flies of the *musca vomitoria* could devour the carcase of a horse sooner than a lion. The unchecked produce of one pair of herrings or mackerel would in a very few years crowd the Atlantic until they had no room to move; and it would not require a century for any pair of birds, or any of our domestic animals, so to stock a continent that not an individual of any other species could exist there.

It is evident, then, that of all the countless myriads of living creatures born within any given period, by far the greater part must be destroyed. The checks upon increase are numerous, but we do not know their full extent or energy. Man does much;

antagonist races do more. Climate has a powerful influence in preventing the spread of certain species beyond their appointed latitudes. Severe cold and intense heat kill vast numbers of young animals. Many are not viable, due to unknown causes. Scarcity of food for such vast numbers is probably amongst the most energetic of destroying agencies. Animals are also subject to epidemics much more destructive than the worst of those to which man is liable. It is with plants as with animals. "All the plants of a country (says De Candolle) are at war one with another;" and animal life is at war with them. Of 357 young plants which Mr. Darwin watched, no less than 295 were destroyed by slugs. All this describes what is metaphorically termed the struggle for existence. "Two canine animals, in a time of dearth, may be truly said to struggle with each other which shall get food, and live; but a plant on the edge of a desert is said to struggle for life against the drought, though more properly it should be said to be dependent on the moisture. A plant which annually produces a thousand seeds, of which, on an average, only one comes to maturity, may be more truly said to struggle with the plants of the same and other kinds which already clothe the ground. . . . In these several senses which pass into each other, I use for convenience' sake the general term of struggle for existence."*

There are many singular instances given of the curious and unexpected correlations between the various forms of life exemplifying this struggle. It would not appear probable at first sight that there could be much connection between cats and the fertility of clover fields; yet it is not altogether impossible. It seems that the visits of bees are necessary effectually to fertilize the clover flowers; only the humble-bee can reach the nectar of the red clover; field mice prey upon the nests and honey of the humble-bee; and cats prey upon the mice. Hence, the more cats there are in a district, the fewer mice there will probably be, and consequently more humble-bees and more abundant crops of clover. The whole chapter upon the struggle for existence is full of instruction, and affords an excellent picture of the constant and internecine warfare in progress between the various tribes of organic life, whether allied or distant.

Natural Selection.—Mr. Darwin having shown that variations of structure *may* arise in successive generations, takes for granted that of these variations, some will be profitable to the individual, and some will be injurious; and that the former will necessarily

* Chap. iii. p. 63.

be preserved, whilst the latter will be rigidly exterminated.* It is difficult to give a full idea of the working of this theory of Natural Selection without quoting the entire chapter with the diagram that illustrates it. We will suppose species A to be primarily existing, and in the course of time, certain varieties, *a*, *b*, *c*, *d*, and *e*, to manifest themselves. In the great struggle for life, *a* and *b*, which are useful variations, enable their possessors to survive; whilst *c*, *d*, and *e*, being injurious, are of course destroyed. This variation from A to *a* or *b*, is *extremely* slight, "infinitesimally" so;† so very small that it takes a thousand (or rather "ten thousand"‡) generations to make the difference ordinarily existing between a species and one of its varieties.§ Varieties *a* and *b* in the lapse of ages are subject to the same possible variations or modifications as those which affected the original species A; and produce (a), (a_1), (a_2), and (b), (b_1), (b_2) respectively; and of these perhaps only (a) and (b_2) are preserved as profitable. By this time (a) and (b_2) have acquired characters sufficiently distinctive to be ranked as separate species; and pursuing the same law of variation and selection, in hundreds of thousands of generations we find (a_m) and (b_n) widely enough separated to form types of genera, each the centre of a number of species.

Although not a *full* exposition of the system, we believe this to be, so far as it goes, a correct one. Of all our objections to the theory, which are many, we at present shall only hint at two, reserving for a time the remainder. The first is that on the hypothesis of a Creator, which Mr. Darwin does not altogether repudiate, his operations are only distinguished by imperfection; and any power of continuance and prosperity is left dependent upon pure accident: species are eminently unfit by nature for preservation, and only endure by chance. The second is, that variations so slight as here supposed, could by no apparent possibility enable their possessors to struggle effectually against destroying agencies such as are enumerated. What advantage could it afford an insect that was about to be swallowed by a bird, that it possessed a thousandth fragment of some property possessed by its next most nearly allied species or variety? What preservation against ravages of the slugs would be afforded by an "infinitesimal" difference between one weed and its neighbour? What minute difference would avail the duckling that the fox was about to carry off? These may perhaps be deemed feeble and trifling

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* See Chap. iv., p. 81.

† See p. 95. ‡ p. 117.

§ After a thousand (or ten thousand) generations species (A) is supposed to have produced two well marked *varieties*." p. 117.

illustrations; yet it is only by bringing the principle to some such practical test as this that its truth or probability can be recognized. It sounds at first plausible enough to say that profitable variations will naturally tend to the preservation of individuals; but when we put it to the test, and see that it is theoretically improbable, and that there is a total lack of direct evidence that such has ever been the case, we are disposed to look upon it as more sound than sense.

Extent and Bearing of the Theory.—More cautious than Lamarck, Mr. Darwin does not dwell minutely upon either the beginning or the probable termination of organic life. We are chiefly left to *infer* that his original organic germ can be no other than Lamarck's gelatinous homogeneous spherule; and that man was developed from something analogous to an ape, and may be further perfected by the same process of development. In the earlier chapters we only hear of species becoming varieties and other species; and the author dwells mostly upon the non-distinction between specific differences and those which constitute varieties. As we progress we find that generic differences are considered only degrees of the same variation; then that all Vertebrata are descended from one parent, the type of which we shall in vain look for "until beds far beneath the lowest Silurian strata are discovered—a discovery of which the chance is very small."* It is only, however, in the concluding chapter that we find a full confession of belief.

"It may be asked how far I extend the doctrine of the modification of species. The question is difficult to answer, because the more distinct the forms are which we consider, by so much the arguments fall away in force. But some arguments of the greatest weight extend very far. All the members of whole classes can be connected together by chains of affinities, and all can be classified on the same principle, in groups subordinate to groups. Fossil remains sometimes tend to fill up very wide intervals between existing orders. . . . . Therefore, I cannot doubt that the theory of descent with modification embraces all the members of the same class. I believe that animals have descended from at most only four or five progenitors, and plants from an equal or lesser number.

"Analogy would lead me one step further, namely, to the belief that all animals and plants have descended from some one prototype. . . . . I should infer from analogy that probably all the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was first breathed by the Creator."†

* Chap. x, p. 338, and see note by Sir R. Murchison, *infra*. † Chap. xiv., p. 484.

As nothing is said to suggest the idea that man differs in anywise from the other "organic beings," we are justified in concluding that his origin was from this same primordial form. This conclusion is still further confirmed by the enumeration of the many advantages to be derived from this view in natural history and psychology. After speaking of the simplification of system that will attend the reception of the development theory, and the far grander views of nature and creation that will accrue, Mr. Darwin continues:—

"The whole history of the world, as at present known, although of a length quite incomprehensible by us, will hereafter be recognised as a mere fragment of time, compared with the ages which have elapsed since the first creature, the progenitor of innumerable extinct and living descendants, was created.

"In the distant future I see open fields for far more important researches. Psychology will be based on a new foundation, that of the necessary acquirement of each mental power and capacity by gradation. Light will be thrown on the origin of man* and his history. . . . .

. . . "As all the living forms of life are the lineal descendants of those which lived long before the Silurian epoch, we may feel certain that the ordinary succession by generation has never once been broken, and that no cataclysm has desolated the whole world. Hence we may look with some confidence to a secure future of equally inappreciable length. And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress towards perfection."†

And what of our aspirations after a glorious immortality? What of that wondrous scheme of redemption which the ancient

* In reference to the history of man, we take this opportunity of alluding to a work recently published, called "Pre-Adamite Man," and professing to be "the Story of our Old Planet and its Inhabitants, told by Scripture and Science." The theory contained in it is, that the creation of man, as described in the *first* chapter of Genesis, is quite distinct from that in the *second*, and alludes to a pre-Adamite race that lived for long ages, and disappeared before Adam was created. These became the angels; and some of them the fallen ones, which accounts for our finding no traces of their existence.

The book is well and pleasantly written; but it is very much to be regretted that very good, but non-scientific men, will join in a controversy which, if fought at all, must be fought by combatants with no flaw in their armour. A weak man, overthrown in however good a cause, does but injure the principle for which he fights. We cannot but respect the good and pious spirit in which this little book is written (with due allowance for the strange theory); but when we are told (p. 59) that water sufficiently heated separates into its component gases, oxygen and hydrogen, which again unite on cooling to form water, and that no fishes are found in any but the *uppermost* of the Silurian strata, with many other facts equally authentic, we cannot but deplore the weakness of the arguments that are but too frequently pressed into the service of reconciling Scripture and science.

† Chap. xiv., p. 489.

seers dimly foretold, gazing with rapt wonder into the profound obscure of the future, whence to them the star of Bethlehem was beginning to gleam? What connection have these with a development theory? Dreams all—figments of a philosophic brain—inventions of priestcraft! What room is there for these in a theory of development? Immortality! How can we be immortal? Our fathers, where are they? From the monad to our immediate monkey-parent, were they immortal? And if not, what claim have we to such an endowment, save by a special interposition of Divine will and power? And it is the very essence of the development hypothesis to account for *all* phenomena *without* such special interposition; all must be due to "secondary causes."* No, we shall live again it is true, but how different our life will be from that "far more exceeding and eternal weight of glory" to which we have been vainly and ignorantly aspiring. Our race shall be perfecting itself by its own powers and faculties, but we shall have no conscious part in it. Our course is run when the grim tyrant has visited us. Of mucus and infusoria we were made, and unto mucus and infusoria we shall return, to run again through the vast cycle of monad, worm, mollusc, &c., up to—where? Redemption! All honour to man rather, he requires no redemption,—he has never fallen. He has ceased climbing trees, and has expelled his former brethren into the wilderness; he has dispensed with his tail; he has invented speech, and looms and railroads, and development hypotheses; he has had no time to fall; no leisure he to be redeemed. His own powers and the accidents of nature are all in all.

We are ready to grant that this is not argument; and that the hopes and faith of the Christian have no weight, no place even, in any development discussion. But we indicate the absolute incompatibility of this hypothesis with any faith in revelation, in order to guard the unwary against the specious fallacies of those who consider that "it is just as noble a conception of the Deity to believe that He created a few original forms capable of *self*-development into other and needful forms, as to believe that He required a fresh act of creation to supply the voids caused by the action of His laws."† As *noble* a conception it may be; indeed, we can see that more skill and ingenuity (not to speak irreverently) might be imagined necessary to create a germ, which after thousands of transformations and millions of ages, should develop itself into so wondrous a mechanism as man, than to create man originally and independently. But this being, as we conceive, utterly at variance with His revealed word, and

* Chap. xiv., conclusion.

† See chap. xiv., p. 481.

excluding all possibility of that highest object of man's aspiration, immortality, it behoves us carefully to inquire into the evidences for such a view, before accepting it, and so virtually renouncing our most cherished hopes.

We have already intimated that Mr. Darwin is not always coherent in his reasoning, and accepts statements that are favourable to his views rather too hastily, and on unsatisfactory authority. One or two examples of this we must give, before proceeding systematically to state our objections to the theory. We have already pointed out the error of the argument founded on Mr. Horner's researches; a little further on we find him referring with approval to Lepsius, whose authority has been discredited for long. The statement at p. 36 as to the inhabitants of Terra del Fuego eating their old women is extremely doubtful, to say the least, and not supported by any ethnological authority to which we have been able to refer. All these, however, may be matters of opinion, and admit of contest; but what can we think of the following statement at p. 64? "Even slow-breeding man has doubled in twenty-five years, and at this rate, in a few thousand years, there would literally not be standing-room for his progeny." True, were the fact so; but what does it mean? If it be intended to imply that one family has doubled its numbers in twenty-five years, it is simply an unmeaning fact;—if that a colony has done so, it is equally unmeaning, and short of the truth. If it apply to a country, it is eminently inaccurate; England as an established country, increases probably faster than any other, and it required the fifty years from 1801 to 1851 to double its population. Again, if the statement be applied to man in general throughout the world, it is so utterly without foundation, as to require no refutation. Thus, in whatever aspect it be received, the statement is either unmeaning or grossly inaccurate.

As instances how facts and opinions may rapidly change their significance in accordance with the varying exigencies of the hypothesis, we select the following out of a great number of similar instances. At p. 109, we find it stated that "from the high geometrical ratio of increase of all organic beings, each area is already *fully stocked* with inhabitants, &c.;" but on the next page it is said that "probably no region is as yet *fully stocked.*"* At p. 110 it is stated that "it is the most closely allied forms—varieties of the *same species*, and species of the *same genus*, or related genera—which, from having nearly the same structure,

* Perhaps there *may be* a reference in one case to *individuals*, and in the other to *species*; but on this view the line of argument is obscure.

constitution, and habits, generally come into the severest competition with each other." Here we seem to have arrived at a general principle; but at p. 114, another view requires support incompatible with this, and we are told that "the advantages of diversification of structure, with the accompanying differences of habit and constitution, determine that the inhabitants which thus jostle each other most closely, shall, as a general rule, belong to what we call *different genera* and *orders*." And at p. 121 (all these occurring in the same chapter, and in different parts of the same argument) we find again that the struggle "will be most severe between those forms which are *most nearly related* to each other in habits, constitution, and structure."

Another series of discrepancies equally marked, though not so readily appreciable without much detail, occurs in the statements with regard to the comparative duration of fossil species and the strata in which they occur. According as it is requisite to prove one view or other, the formation is supposed to be of shorter, of identical, or of vastly longer duration than the species. At p. 293, it is said that "although each formation may mark a very long lapse of years, each, perhaps, is short, compared with the period requisite to change one species into another;" and yet, at p. 298, we find "parent species and modified descendants" existing in the "upper and lower beds of a formation;" and at p. 301, it is again doubted whether the period requisite for the deposit of one formation "would exceed the average duration of the same specific forms." These discrepancies may appear trifling to some; but they occur in, and seriously affect the stability of, the very heart and core of the geological argument.

There is no principle more frequently and distinctly enunciated in this work than that natural selection can only act by preserving variations of a minute character, which will enable their possessor to contend more vigorously in the struggle for life. At p. 205, natural selection is defined—"a power which acts solely by the preservation of profitable variations in the struggle for life;" and at p. 149, it is remarked that "it should never be forgotten that natural selection can act on each part of each being, solely through and for its advantage." By the terms of the hypothesis also natural selection is the sole means whereby species, genera, orders, &c., are formed. When we find, therefore, a species naturally selected because of the possession of a certain organ, we are perhaps justified in feeling some surprise that a closely allied species should have been selected, because of the *absence* of that organ. Yet such is the flexibility of this theory, that facts of this order only seem to strengthen it to the mind of its author. For instance, in Madeira there are various

kinds of beetles, some having wings largely developed, some having moderate ones, and some without. It is rather amusing to see the manner in which these differences are reconciled to the theory. The large wings are "quite compatible with the action of natural selection. For when a new insect first arrived on the island, the tendency of natural selection to enlarge or reduce the wings would depend upon whether a greater number of individuals were saved by successfully battling with the winds, or by giving up the attempt, and rarely or never flying."* Then in the same page the author adds that certain considerations have made him "believe that the wingless condition of so many Madeira beetles is mainly due to the action of natural selection, but combined probably with disuse. For during thousands of successive generations each individual beetle which flew least, either from its wings having been *ever so little* less perfectly developed, or *from indolent habit*, will have had the best chance of surviving from not being blown out to sea; and, on the other hand, those beetles which most readily took to flight would oftenest have been blown out to sea, and thus have been destroyed!!" It is rather difficult to imagine any reasoning much more puerile, occurring in a grave scientific work, the results of which upon natural history and philosophy generally are to be so striking.

Another instance of the pliability of the theory is found in the account of the action of natural selection upon certain blind rats in the caves of Styria and Kentucky. Natural selection has acted here by preserving blind animals, because those which had sight might be subject to "inflammation of the nictitating membrane!"† But it seems that in one of the blind animals the eyes themselves are of "immense size;" and it would appear to be a most extraordinary mistake of "natural selection" to preserve this animal merely *because* blind, whilst its "immense" eyes still remain liable to the objectionable inflammation. We might also reasonably ask what has "natural selection" been about not always to select blind animals to live in caves, but to limit its favours to a few instances, and those excessively doubtful?‡

In many parts of the argument Mr. Darwin evinces a strong tendency to support himself upon possible, though non-existent or highly exceptional, rather than upon normal and generally-observed phenomena. This is nowhere more remarkable than in the attempt, which is of course absolutely essential to the theory

* See p. 136. † See p. 137.

‡ "Natural Selection" is frequently spoken of in this work, almost in terms of personality;—as being "ever on the watch," and "ready to seize upon" anything to the advantage of an individual.

to prove, that there is only a difference of degree (not of kind) between species and varieties—that varieties, in short, are species in process of development; and, by parity of reasoning, that species are incipient genera—genera incipient orders, &c., &c. It does sometimes happen that *varieties* of a certain species present differences which are apparently more marked than those between certain other closely-allied *species*. But there is always (or nearly so) one decided test—varieties of a species will cross and produce fertile offspring; whilst species, however closely allied, will sometimes cross, but never produce *fertile* offspring. This is generally reckoned the great distinctive mark between species and varieties; and this, by the requirements of the theory, must be done away with. Now to do this, Mr. Darwin has sought out a few rare, exceptional, if not chiefly doubtful, instances. Some of the crosses between allied species have exhibited a partial and dubious fertility for one or two generations, when recrossed with one of the pure parent breeds, although he is himself compelled to "doubt whether any case of a perfectly fertile hybrid animal can be considered as thoroughly well authenticated."* In still rarer instances, well-ascertained varieties have appeared wanting in fertility to some extent. On such extremely slight grounds as these Mr. Darwin considers himself justified in viewing the overwhelming amount of evidence derived from fertility and non-fertility, as a matter of *degree* only.

Nothing has struck us more forcibly, on a general survey of this theory, than the total absence of direct evidence of any one of the steps. No one professes to have ever seen a variety (producing fertile offspring with other varieties) become a species (producing no, or unfertile, offspring with others). No one knows of any living or any extinct species having given origin to any other, at once or gradually. Not one instance is adduced of any variety having ever arisen which did actually give its possessor, individually, any advantage in the struggle for life. Not one instance of any given variety having been actually selected for preservation, whilst its allies became extinct. There is an abundance of semi-acute reasoning upon what might possibly have occurred, under conditions which seem never to have been fulfilled; but not the least fragment of direct testimony, either derived from human experience, or from the geological record.

What then is the "*final cause*" of this theory? Simply, so far as we can gather, because Mr. Darwin observes certain phenomena in the order of nature, and the distribution of animal and vegetable life, which he conceives to admit of no explanation

* See p. 252.

on the theory of immediate creation, but to be perfectly comprehensible on that of natural selection. It may be worth while to enumerate a few of these mysterious facts, to show us what a Creator cannot do, and what a blind accidental agency can, in the opinion of progressionists.

Organic life admits of classification; varieties group around species, species around genera, genera around classes, and so on. The result is a natural system of alliances and affinities, acknowledged by ordinary mortals, as well as by the supporters of "development," to be one of great beauty and order. Upon this our author remarks, "This grand fact of the grouping of all organic beings seems to me utterly inexplicable, on the theory of creation."* It would be difficult to say *why;* unless it be by confessing that intelligence cannot devise, though an interminable series of accidents may accomplish, a scheme calculated to excite the admiration of all who study it.

Mr. Darwin "cannot see" on the theory of creation, why one shell should be bright coloured and another dim,† though natural selection makes all clear. He cannot see why animals that live in caves should have affinities to those that live in their neighbourhood;‡ why stripes should occasionally appear on young horses;§ nor why certain animals and plants should be on islands and not on continents, or *vice versa*‖—all these things creation is powerless to explain; but natural selection relieves us of the difficulty.

Unity of type in the vertebrate skeleton, and the formation, and juxtaposition of the bones of the skull,¶ are equally mysterious, until understood by the light of this omnipotent natural selection. But the most remark-worthy instance of the superiority of natural selection over creation is found on p. 480. Here Mr. Darwin enumerates certain formations in animals, which "bear the plain stamp of *inutility.*" "On the view of each organic being, and each separate organ having been specially created," these are all "utterly inexplicable;" but natural selection reveals therein Nature's "scheme of modification, which it seems that we wilfully will not understand." In other words, by the terms of one hypothesis, boundless wisdom and power, working intelligently, though sometimes mysteriously to us, fail to explain an *apparently*

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* p 471. † p. 133. ‡ p. 139.

§ "How inexplicable on the theory of creation is the occasional appearance of stripes on the shoulder and legs of the several species of the horse-genus, and in their hybrids." p. 473.

‖ p. 478.

¶ "Why should the brain be enclosed in a box composed of such numerous and such extraordinary-shaped pieces of bone? How inexplicable are these facts on the ordinary view of creation!" p. 436.

useless structure; which, however, is fully and satisfactorily cleared up by another hypothesis, the very essence of which is that its subject selects and preserves only "*useful variations.*"*

On all these instances, we may remark generally, that if Mr. Darwin *cannot see* how creation can account for them, there must be some judicial blindness involved. For by the very conditions of each theory, any one given fact must necessarily be equally explicable on either. The theory of natural selection can only provide for each animal having attained its present structure, appearance, and geographical distribution, because these were most appropriate to it and to each other; by the hypothesis, any individual or species having an organisation unfitting it to struggle with the climate, &c., is exterminated ruthlessly; and so those that are mutually adapted alone remain together. All which amounts to this, that each species is located in the best place for it, the very first and essential condition of all our ideas connected with intelligent creation.

But it is time for us to inquire whether there are any indications, either in the present state of matters, or in the past history of our earth, so far as we can read it, that would lead us to infer that "development" had been the law according to which our present system of organic existence has been produced. What would be these indications? Clearly in the present we ought to find innumerable transitional forms connecting each species with its neighbours, admitting of no lines of demarcation. In the past, we ought to read of a constant improvement, and transition from the simplest to the most complex forms of organisation. We ought to find records of a time when the lowest forms of life alone inhabited our earth; and from this up to Man, we should read of a constant succession of forms each higher than the preceding one. Owing to the imperfection of the record, we might expect not to find *all* this; but we ought certainly never to meet with anything clearly opposed to such a succession. What are the facts?

We need not go far into the discussion as to whether species at the present time are connected by innumerable transitional forms. Mr. Darwin himself everywhere confesses that they are not; and that this clear and enduring separation of species "is probably the gravest and most obvious of all the many objections which may be urged against his views."† This objection, however, is summarily got rid of by the theory of "*extinction*," another assumption as gratuitous, and as unsupported by any direct evidence, as that of selection; "the parent and all the transitional varieties will

* "Origin of Species," *passim.* † p. 300.

generally have been exterminated by the very process of formation and perfection of the new form."* But where are they? Shall we not find some of them at least in the geological formations? No, or very rarely, is the answer; for most probably the conditions of the earth were not favourable to their preservation.†

The next objection is clearly enough seen by our author; "but it may be urged that when several closely-allied species inhabit the same territory, we surely ought to find at the present time many transitional forms."‡ Doubtless we ought, and we cannot see that Mr. Darwin's mode of disposing of the difficulty is at all satisfactory. To do this he contends that these continuous areas have not been always continuous, but in the condition of islands, on which the separate species have originated; and therefore the transition forms are wanting! As this does not quite meet all the conditions, it is further suggested that the intermediate forms *did* exist in certain intermediate zones; but being subjected to oppression from both sides, their existence was but brief, and they vanished without leaving any trace. The entire theory of extinction is to us non-coherent and incomprehensible; it was, however, essential to the other views.§

Such being the testimony of the present, what of the past? The entire question is discussed in the chapter on the "Geological Record" at considerable length, and with much acumen. Formerly it was to geology that the supporters of the Lamarckian hypothesis appealed most triumphantly as corroborating their views. Later and fuller discoveries have much modified the tone of this appeal. Now that it is known that the lowest and earliest of our palæozoic formations indicate the presence of cephalopoda and fish of a very high order and large size in the Silurian seas; and that the traces of even mammalia have been found so low down in the secondary series, as to suggest the belief that animal life has been more dependent upon geographical conditions than chronological relations or succession; now that all this is known, with much more to the same effect, it is clear that progressionists can look for support to geology *as it is* no longer, but must appeal to it as it *may* or *might* be. The whole of the chapter referred to, though containing much interesting matter, may, as to its

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* p. 172. † See chap. ix., on the "Geological Record," *passim*. ‡ p. 173.

§ It is worthy of notice, that whilst developing his theory, the author speaks of species only changing through countless ages and generations; but when it becomes necessary to account for the broad lines of demarcation between species, and the intervening forms have to be extinguished, they are passed over more lightly, as being few in number, and of weak powers of resistance—as merely transitional from one well defined form to another; instead of being, as they really must be, on the theory, as numerous and powerful races as any of which the records are found previously, in their own day and generation.

bearing on the "development" or "selection" theory, be summed up in very few words. Geology is found to give *no support* to the doctrine; and its records are pronounced to be extremely imperfect.* As to the intermediate or transition forms, Mr. Darwin says:—

"Geology assuredly does not reveal any such finely graduated organic chain; and this perhaps is the most obvious and gravest objection which can be urged against my theory. The explanation lies, as I believe, in the extreme imperfection of the geological record." p. 280.

"I do not pretend that I should ever have suspected how poor a record of the mutations of life the best preserved geological section revealed, had not the difficulty of our not discovering innumerable transitional links between the species which appeared at the commencement and close of each formation, pressed so hardly on my theory." p. 302. And

"He who rejects these views on the nature (*i. e.* the extreme imperfection) of the geological record, will rightly reject my whole theory. For he may ask *in vain* where are the numberless transitional links which must formerly have connected the closely allied or representative species found in the several stages of the same great formation." p. 342.

After these plain confessions of want of support from geology as it now is, the difficulty is cut at once. Where are the transition forms connecting the species in the same formations? The answer is ready; they are not preserved—the conditions were unfavourable. "Where are the remains of those infinitely numerous organisms which must have existed long before the first bed of the Silurian system was deposited?"† This question refers to the fact of finding creatures of high organisation in the earliest seas, whence the supporters of "development" were obliged to hypothecate countless ages of development before the age of trilobites. The answer to it is equally trenchant and conclusive, "They may now all be in a metamorphosed condition,‡ or

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* It is worthy of notice that whilst Mr. Darwin appeals to the imperfection of the geological record in support of his views, Sir Chas. Lyell quotes it as bearing adversely upon the theory of development. He says:—

"It has always appeared to me that the advocates of progressive development have too much overlooked the imperfection of these records; and that, consequently, a large part of the generalizations in which they have indulged in regard to the first appearance of the different classes of animals, especially air-breathers, will have to be modified or abandoned.—"Address to the British Association, Sept. 14th, 1859."

† p. 343.

‡ "The hypothesis that all the earliest sediments have been so altered as to have obliterated the traces of any relics of former life which may have been entombed in them, is opposed by examples of enormously thick, and often finely levigated deposits between the lowest fossiliferous rocks, and in which, if any animal remains had ever existed, more traces of them would be detected.

may lie buried in the ocean."* Can Mr. Darwin fail to see that there cannot be imagined any theory of ontology in the wildest mind that would not be equally well supported by this style of argument? Proof! If it be there, well and good; if not, perhaps it is at the bottom of a fathomless ocean: you cannot possibly say that it is not, and meantime my theory holds good.

But geology has its tale to tell, and one which appears not only not to support, but clearly to controvert the development theory. It never was the small and feeble species or germ that first appeared either amongst molluscs, fish, reptiles, or mammals. Where are now the representatives of the gigantic fishes of the old red sandstone? Where are the mighty reptile tyrants of air, earth, and water of the oolite? Have they been "improved" and "preserved" into the puny representatives of the modern reptile class? Where are the ponderous monsters that shook the eocene and miocene earth with their massive tread. Where is the megatherium, unless *improved* into the feeble sloth of the present day? These races appeared in the plenitude of their power; and as their dynasty grew old, it was not that the race was "improved" and preserved in consequence; but they dwindled, and were, so to speak, degraded, as if to make room in the economy of nature for their successors. But this is too large a subject to enter upon at this advanced part of our task; we can but indicate it, and appeal with confidence to all geologists for its accuracy.

There remain two objections to this development theory, which we must find space to notice, of such weight as almost to stagger the author himself. These refer to the origin by natural selection of organs of such complexity as the perfect eye, and to the development by the same means of complicated instincts; such, for instance, as the cell-building instinct of the bee and wasp. On the former objection, Mr. Darwin writes:—"To suppose that the

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"The fine aggregation and unaltered condition of these sediments have permitted the minutest impressions to be preserved. Thus, not only are the broad wave-marks distinct, but also those smaller ripples which may have been produced by wind, together with apparent rain-prints as seen upon the muddy surface, and even cracks produced by the action of the sun on a half-dried surface. Again, as a further indication that these are littoral markings, and not the result of deep-sea currents, the minute holes left by the Annelides are most conspicuous on the sheltered sides in each slab.

"Surely, then, if animals of a higher organization had existed in this very ancient period, we should find their relics in this sediment, so admirably adapted for their conservation, as seen in the markings of the little arenicola, accompanied even by the traces of diurnal atmospheric action."

Such is Sir R. Murchison's opinion as to the probability of there being fossiliferous rocks far below the Silurian, in a metamorphic condition.

* p. 343.

eye, with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic observation, could have been formed by natural selection seems, I freely confess, absurd in the highest possible degree." And so far we are able cordially to agree with him; yet after this candid confession our surprise was great to find an explanation attempted by means of this sole "*deus ex machinâ*," natural selection. And Mr. Darwin seems to suppose that he has given an explanation when he mentions the gradations from the simplest to the most complex eyes, without attempting to account for an eye ever having existed at all.] [In the course of the illustrations, some few additional lights are thrown upon the action of natural selection tending to show that it can "improve" races to their disadvantage, as, for instance, the improvement in the structure of the sting of the bee or wasp, until it is so finished that "when used against many attacking animals (it) cannot be withdrawn, owing to the backward serratures, and so inevitably causes the death of the insect, by tearing out its viscera."* Mr. Darwin judiciously forgets to allude to the existence of such an organ as the internal ear in the higher animals; as to give even a verbal theory of its formation by natural selection would have baffled any attempt.

The development of the most remarkable instincts—that which leads the cuckoo to lay its eggs in nests of other birds—that of the slave-making ants, and the comb-building of the bee-hive—affords but additional illustration of the operation of natural selection. The American cuckoo builds its own nest; probably the English cuckoo did so once, but occasionally laid an egg in another nest. "If the old bird profited by this occasional habit, or if the young were made more vigorous . . . . then the old bird, or the fostered young, would gain an advantage,"† which advantage would tend to produce by inheritance a propagation of the "aberrant habit." Surely this is very Midsummer madness.

Passing over the slave-making instinct of some ants, we must notice how by natural selection the hive-bee has come to build its wonderful cell. "He must (says our author) be a dull man who can examine the exquisite structure of a comb, so beautifully adapted to its end, without enthusiastic admiration." And yet it has arrived at this perfection, not by design of any creator, but simply by accidental variation, and natural selection of the best forms. The cell of the humble bee is very simple—that of the hive-bee very perfect and complex. But there is a Mexican bee, the *Melipona domestica*, whose cell is in some sort interme-

* p. 202. † p. 217.

diate between the two. Now the problem is, how is the Melipona to be naturally selected and improved until it can build a cell like the hive-bee? It is solved in this wise:—

"If a number of equal spheres be described with their centres placed in two parallel layers, with the centre of each sphere at the distance of radius × $\sqrt{2}$, or radius × 1·41421 (or at some lesser distance) from the centres of the six surrounding spheres in the same layer; and at the same distance from the centres of the adjoining spheres in the other and parallel layer; then if planes of intersection between the several spheres in both layers be formed, there will result a double layer of hexagonal prisms united together by pyramidal bases formed of three rhombs; and the rhombs and the sides of the hexagonal prisms will have every angle identically the same with the best measurements which have been made of the cells of the hive-bee."—p. 227.

By what follows we are led to suppose that the Melipona must know all this,—must "*somehow judge accurately*" of distances, &c.—must act upon it; and then "this bee would make a structure as wonderfully perfect as that of the hive-bee."* And further, "by such modifications of instincts, in themselves not very wonderful,—hardly more wonderful than those which guide a bird to make her nest,—I believe that the hive-bee has acquired, through natural selection, her inimitable architectural powers."†

Truly, some philosophy, when translated out of its own idiom into the vernacular, sounds wonderfully like folly. Having advanced thus far in our analysis of Mr. Darwin's theory, we think it inadvisable to pursue the subject; for either these are the vagaries of a "distempered brain," or our author is attempting to play off a solemn hoax upon the scientific world; and to this latter theory we do begin "seriously to incline."

If, however, all this be intended as real argument and science, we will only in conclusion give a brief summary of the result of the entire argument:—

1. The hypothesis of descent or development from one original form, or a few forms, does not appear to be required by any peculiarities of organization, affinities, or geographical distributions; none of these presenting any difficulties more insuperable on the ordinary theory of creation than by this theory.

2. This hypothesis is inadequate to account for the change of any one species into another, when applied to individual instances. It fails wholly also to give any rational history of the *origin* and development of new and complex organs, and *à fortiori* of elaborate instincts, such as those noticed.

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* p. 227. † p. 228.

3. There does not appear to be any evidence of the occurrence of "*useful variations;*" nor any prospect that these, minute as they are represented to be, can be of any avail in the struggle for life, against influences of such potency.

4. There is an entire lack of direct evidence as to any change in species. On the contrary, all history tells of their constancy. *No new organ has ever been known to have appeared.*

5. Neither between species as now existing, nor between those of which we find the records in the earth's strata, is there the slightest evidence of that *fine gradation* of *transitorial forms* which we ought to find had organic life been developed on this principle.

6. There is no evidence anywhere of the development of higher from lower forms. On the contrary, it appears that the higher tribes of any given race first appeared; and that the type afterwards dwindled or was "degraded," before the advent of a higher order.

7. The assumption of evidence which may possibly exist somewhere, under the ocean, or in a metamorphic condition, is a gratuitous and dangerous hypothesis, by which any conceivable theory might equally be supported.

Nevertheless, we rise from the perusal of this very remarkable book, not more impressed with the singularly profound inaptitude of the entire hypothesis, than we are with the patience manifested by the author in the accumulation of facts,—the artistic skill with which he can impress them into the support of the most opposed positions,—and the fertility of resource and indomitable courage with which he battles for his theory, in the face of the most overwhelming odds of opposed phenomena;—qualities which, if better directed, could scarcely fail to enrol the name of Darwin amongst those which have become classic in Natural History.
