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ART. VII.—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.G.S., F.L.S., Author of Journal of "Researches during H. M. S. Beagle's Voyage round the World." London: John Murray. 1860. 5th Thousand.

John Duns

If notoriety be any proof of successful authorship, Mr Darwin has had his reward. Seldom has an avowedly scientific work had public attention turned to it so speedily as Mr Darwin's "Origin of Species." His Theory has already become historical. It has assumed a position in which it commands the attention of all who take an interest in the generalizations of natural science. Some leading naturalists affirm that it is incontrovertible; others, less bold, yield a qualified assent. Royal Societies discuss it, and it is talked over at the Clubs. It is received with smiles in drawing-rooms, and frowned down in churches as "a second edition of the 'Vestiges.'"¹ Has this wide-spread notice been gained by the work as one of true science? Or has the substantial food which, without doubt, it contains, been received for the sake of the spice mixed up with it? If so, is the attractive element to be chiefly found in a somewhat unreverential walk in fields of investigation, into which the greatest thinkers have never entered but with bent body and head uncovered?

Mr Darwin's well-earned reputation as an accomplished zoologist, was sure to gain for him a patient hearing from all who are working in any one of those branches of natural science, from which he profusely draw illustrations in proof of the soundness of his theory. The whole subject under discussion is, moreover, in every respect, one of the most difficult which can engage the attention of a philosophic naturalist. But, on this very account, it is also one which will lavishly reward the student who shall be able to shed new light on it. Has Mr Darwin done so?—is the query for which we propose to seek an answer in the work now before us.

Man is the interpreter of nature. This place has been assigned to him by the Creator, and, obeying his own instincts, he has ever been forward to occupy it. Here, however, it ought to be borne in mind, that, on the one hand, the interpreter is not infal-

¹ Whether justly or not, we hope to show in the sequel. Meanwhile it is but fair to quote Professor Huxley's caveat: "Lamarck's conjectures, equipped with a new hat and stick, as Sir Walter Scott was wont to say of an old story renovated, formed the foundation of the biological speculations of the "Vestiges," a work which has done more harm to the progress of sound thought on these matters than any that could be named; and, indeed, I mention it here, simply for the purpose of denying that it has anything in common with what essentially characterizes Mr Darwin's work."

libile; and, on the other hand, that, even when in the main true, the interpretation will always be more or less marked by the intellectual, and often by the moral, characteristics of the one making it. It is all very well to talk of a perfectly unbiassed mind, complete impartiality, and the like, in the examination of questions in science which have necessary moral or theological relations. We believe that, in the circumstances, freedom from bias is impossible. But, granting all this, we are not to despair of ever attaining absolute truth even in such questions. Men will agree in admitting certain observations as in themselves reliable, who would widely differ as to the bearings of these on favourite theories. Given, we might say, the point of view of prejudice, and the amount and direction of divergence may be calculated as certainly as that of the ship's compass, when we know where the disturbing metal on board is. Some naturalists are satisfied with collecting facts; others are never satisfied till they have set these in relation to other facts, in order that they might have material for generalizations regarding laws of life. The former are apt to hold that this is the highest, and, indeed, the only legitimate work of a man of science, while the latter are convinced that facts are worthless until they are seen shedding light on the working of natural laws, or revealing to us the thoughts of the great Creator. Yet it is from those who really take the highest views of nature that truth has often most to dread, for it is here that the disturbing elements have scope. Kingsley represents his *Andromeda* as

“Shading her face with her hands; for the eyes of the goddess were awful.”

Such an effect has the first clear discovery of the thoughts of a present Creator in His works on many observers. They were faithfully questioning these, when, suddenly, they found themselves on a threshold upon which the glory of a Divine One was cast from the other side; but, instead of courting a clearer view, they drew back, “shading their face with their hands.” From that moment the idea of a Creator is bearable only as they see it, as Edward Irving loved to see theological dogmas, “looming in the mist;” and in all they write they seem ever distrustful of views of nature which, even remotely, tend to set them or their readers in direct relation with a personal God. Now, though we are very far from alleging that this must be a leading characteristic of the author of the theory now under review, we yet hope to show that the tendency of his book is very strongly in that direction. It would not be dealing fairly by our readers, and, especially, it would be unmindful of the apologetic value of natural theology, were we to look at this theory from any other point of view, than the twofold one of science and theology. We feel,

however, that, in making such a statement as this in the outset, we are liable to be misunderstood.

If called to dissent from Mr Darwin's views on the origin of species, we are not to be held as making light of his present work. On the contrary, we shall ever be found ready to acknowledge the great ability shown in it—the varied information contained in almost every page—the classic beauty of style in which the work is written—and, above all, its value as suggesting new lines of investigation, and as pointing out all the weak points in present generally accepted systems of classification. The two characteristics last mentioned have, at one point and another, forced upon our notice the resemblance between "The Origin of Species," and the "Zoonomia" of the elder Darwin. We could point out many passages in both which warrant this statement. In both we find a skilful exposition of the scientific *status quo*, a bold dissent from it, and the proposal of theories which are brought out, not only as craving a hearing, but as the only satisfactory basis for the explanation of all the phenomena of the past, and the only key to all progress in the future. In the least attractive pages of both works, also—pages in which strong belief hankers on the very edge of weak credulity—you meet with most suggestive remarks, lying like bits of gold in lumps of quartz. In other respects the likeness holds good. In the midst of the physiological and psychological romance in "Zoonomia," are many hints, such as genius only makes, in which we can now recognise the foreshadowing of generalizations which have become generally acquiesced in by men foremost in such branches of human knowledge. Thoughtful readers of "The Origin of Species" will have an instinctive feeling of the presence of such hints in Mr Charles Darwin's work.

With this acknowledgment of the suggestive character of the work, we have a preliminary remark to make, on the general value of the facts in proof, which are scattered so freely over the volume, and which, though so numerous, we are informed, are but as one to a million, compared with what is in store, when the great work which is promised shall be given to the world. In almost every page we meet with facts which, as we shall have occasion to show, may be found as useful to an opponent as to an advocate of Mr Darwin's views; while of many of them one cannot help standing in doubt as to their value, when considered even from the author's point of view. Facts which call up the common expression, "much may be said on both sides," lead to a state of mind as unfavourable to correctness and precision of thought, as it is damaging to theories on the spread of which their authors are earnestly set. In the case now before us, however, there is a double disadvantage. In addition to what is now

stated, we are asked to take the proofs without references, and to believe that, if those thus adduced are not sufficient to establish important propositions, it is because the author could not, in a work like the present, bring out all he has in store. Now we may state at once, that while we have entire confidence in Mr Darwin's statement, we have met with so many alleged facts, which, to say the least of them, are questionable, that we must be excused if we do not place such confidence in this *corps de reserve* as our author would like his readers to do.

"No one," says Mr Darwin, in his Introduction, "ought to feel surprised at much remaining as yet unexplained, in regard to the origin of species and varieties, if he make due allowance for our profound ignorance in regard to the mutual relations of all the beings which live around us. Who can explain why one species ranges widely, and is very numerous, and why another allied species has a narrow range, and is rare? Yet these relations are of the highest importance; for they determine the present welfare, and, as I believe, the future success and modification of every inhabitant of this world. Still less do we know of the mutual relations of the innumerable inhabitants of the world, during the many past geological epochs in its history. Although much remains obscure, and will long remain obscure, I can entertain no doubt, after the most deliberate study and dispassionate judgment of which I am capable, that the view which most naturalists entertain, and which I formerly entertained, namely, that each species has been independently created, is erroneous. 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 way 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."—P. 6. Such, in few words, is Mr Darwin's profession of faith. It must be acknowledged, that the numerous contradictory definitions of the term *species* now current, and the universal proneness of naturalists to multiply species, so called, by elevating well-marked varieties to this rank, are enough to provoke students, who have no desire to have their names associated with their discoveries, to take refuge in any theory that might hold out hopes of rest, as regards a satisfactory scheme of nature. Will Mr Darwin's be to them what the ark was to the dove in the waters of the deluge? Now that so many have been turned to it in hope, the question is of grave import. In seeking the answer, our criticism must of necessity appear somewhat fault-finding; but we shall much regret, if, in our desire to reach the truth, we shall ever be led

to leave out of view considerations, on the acknowledgement of which the author has a right to insist. We feel the difficulty of the task; not so much, however, as regards the certainty of our ground, as in grouping Mr Darwin's scattered facts in proof, so as to help us to see the strength or weakness of the positions laid down.

Much of the interest of the discussions now under review will be found connected with current views of a philosophical system of classification. Mr Darwin does little more than glance incidentally at these, until near the end of his book. For obvious reasons, we prefer to direct attention to them in the outset.

In 1798, Cuvier gave, in his "*Tableau Elementaire de l'Histoire Naturelle des Animaux*," a rough outline of those principles of classification which working naturalists have, since that time, found wonderfully equal to the wants of advancing science,—a circumstance which, apart from their philosophical simplicity, is a strong testimony to their truth. But, if Mr Darwin's views have any just claim on our attention, we have been retrograding since 1798. The principles laid down in the introduction to the *Tableau* possess great value, when we associate them with the labours of Cuvier in after life, in accumulating corroborative facts. The "*Regne Animal*," and the "*Recherches sur les Ossements Fossiles*" tell everywhere the same tale as to the soundness of the principles in chapter third of the introduction. Cuvier's review of living forms, and his survey of Egyptian monuments, which enabled him to follow the history of certain species for several thousand years, hastened to proclaim that species are immutable. And, we may add, the examination, from the palæontological point of view, of species which had been in existence during periods which are to all the years of Egyptian history as a million of years are to a moment, is ever ready to bear witness to the same fact. But we anticipate remarks to be made on the chapter in Mr Darwin's work on the "Imperfection of the Geological Record." We have now to do with classification. The appeal to structural peculiarities, as bases for a system in harmony with the demands of science, should not, as M. Agassiz has clearly shown in his recent work on this subject, exclude every other element. Conclusions drawn therefrom may be strengthened or modified by phenomena in embryology, in physical condition, as climate, food, and the like—the former being studied with reference especially to *species*, the latter with reference to *varieties*—to which frequent allusion will be made in this paper. There is yet another element requiring to be taken into account in all generalizations on this subject. We mean, as much of Divine plan in creation as we may have attained to the knowledge of in the study of nature,—the recognition, in short,

of a present Creator in all quarters of creation, and at every point in its history, from the time at which He laid the foundation of the earth to the present moment, when He invites us to the examination of those works which are "sought out of all who take pleasure therein." We state this at the risk of being misunderstood, and of appearing to drag into the discussion questions which may be held foreign to it. But the fact is, you can no more come to a just conclusion as to the relations between one department of science and another, and between different forms of life, with both of which classification must deal, without the recognition of a living, purposing mind in regulating these relations, than you can form a correct estimate of the working of any piece of mechanism without looking at the intention of its inventor. Even in the fine arts, just appreciation comes to turn upon our sympathy with the artist. But if we break up the historical picture into bits, though they may be bits of beauty, and refuse to look at all the parts from the point of view of the intention of the artist, so far as he has made that known to us, we must blunder in our estimate of the parts which we have refused to look at in this light. In the case now before us, the Creator has opened up to man much which is fitted to make us acquainted with His intention; and the more we see of this, the nearer we get to an understanding of that one true plan which systematists are seeking to bring fully out, and which will attain to reliable historical expression only in the measure in which man, the interpreter of nature, shall succeed in understanding the intentions of the Creator revealed in His works. It is to be regretted that little value is attached to this thought, and that many even studiously exclude it from their researches, as if to introduce it implied disqualification for their work. Mr Darwin is not slow to intimate how he regards this subject. "Many naturalists think," he says, "that something more is meant by the natural system (than a scheme for arranging together those living objects which are most alike); they believe that it reveals the plan of the Creator; but, unless it is specified whether order in time or in space (why not both, and order in place likewise?), or what else is meant by plan of the Creator, it seems to me that nothing is thus added to our knowledge."—P. 413. Again, at p. 435, he remarks, in a way which, to say the least of it, does not bear witness to very enlarged views of creation: "Nothing can be more hopeless than to attempt to explain this similarity of pattern in members of the same class, by utility or by the doctrine of final causes. The hopelessness of the attempt has been expressly admitted (?) by Owen, in his most interesting work on the 'Nature of Limbs.' On the ordinary view of the independent creation of each being, we can only say that so it is; that it has

so pleased the Creator to construct each animal and plant." A good deal more can be said of each animal and plant than this; but if in ten thousand instances, in which we find unquestionable evidence of final cause, are we not to conclude that, if our knowledge were complete as to one instance, in which we do not at once observe this, the same testimony might be expected as in the others. We are not shut up to the *sic placebat* so much in His absolute sovereignty, as in regard to our ignorance and the limited character of our powers. What is a mystery to a child in the actions of his parent, may be well understood when he comes to be a man. What would be implied if we expressed our present knowledge of the use of the serrated claw on the anterior toe of *Caprimulgus Europæus* in the phrase, "It has pleased the Creator to distinguish this bird from all the other fissirostres by supplying it with a comb-like claw, the use of which we do not see?" Not, certainly, that there is no illustration of the doctrine of final causes here, but only that we are not sufficiently acquainted with the habits of the goatsucker to be able to say what its true use is. The numerous illustrations of this same doctrine in the structural relations of animals widely differing in general form and habits, but ranged under one great type, had as true an existence from the beginning, as they have now that Owen's researches in homology have given us the key by which they can be read. But is there only one great type, and one great plan? Or do we meet with a far higher thought than Mr Darwin is willing to acknowledge, in connection with several great types whose leading divisions are constructed on different plans? Do the radiata, for example, follow in structure the plan of the vertebrata? The whole direction of the most philosophical investigations in natural science is to accumulate proofs of four distinct plans, after one or other of which all animal life has been formed. And it is at this point that *sic placebat* may most naturally be affirmed. In the evolution of these, under the four great types—vertebrata, articulata, mollusca, and radiata—we find the basis for the doctrine of final causes which Mr Darwin has no favour for, but apart from the recognition of which all nature would be a scene of confusion. It is not unnecessary to call attention to these things. There are many evidences that some most accomplished naturalists are drifting from moorings which ablest systematists and most profound thinkers, from the days of Bacon, have regarded as not only safe, but also most suited to the requirements of advancing science. We have heard of a learned instructor gravely asserting, that "the more deeply he examined nature, the greater confusion he found prevailing." Yet we suppose the same person could no more interest half a dozen of intelligent young men, in any one branch of natural

science, without a system of classification, than Buffon, who set out from the confusion point of view, could get on with his work without looking at animals in groups, formed on the basis of general resemblance. It might be worthy a passing thought from such students, that they find material for classifying, not because nature is a chaos to be reduced to order by their great attainments, but because order and beauty existed everywhere before they condescended to devote their talents to the study of it. But it is well that men's lives are often better than their principles, and their practice often far ahead of their theories, as was the case with that sage who, though firmly and consistently confident in the denial of the existence of a God, did not dare sleep in a room by himself for fear of the devil!

Objections to the present generally accepted system of classification proceed on the assumption that a perfect scheme is possible. But it is forgotten that this implies not only a knowledge of every object in the animal and vegetable kingdoms, but acquaintance also with all the relations of distinct forms to those nearest them. It is well to strive to approach this as the *beau idéal*, just as in morals it is the duty of each man to strive after attaining to the perfect likeness of the sinless One. The standard in the former case, as in the latter, is one which no man on the earth will ever be able to say he has fully reached. But the existence of well-marked divisions is not the less real on this account. All agree in making a distinction between animal life and vegetation, notwithstanding the wide field for controversy at those points where the two kingdoms seem to meet. Here, as in every department of human knowledge, mankind have come to a general agreement as to a fact; but this has not been reached through a series of definitions, equal to the demands of purely scientific observers. It has been attained through the apprehension of well-marked differences. The questions, What is an animal? what is a vegetable? would, however, land us in the heart of controversies, to settle which the life of any man is too short. We all remember how doctors recently differed, when the question was put in a court of law, "What is coal?" The conflicting answers showed that a *perfect* definition is impossible. Yet it is not on this account less true at the present moment, that coal is coal, and that we are all understood when we use the term to distinguish certain substances—we dare not say minerals, for this would lead to controversy—with which we are all more or less familiar. Looking at discussions on terms from this point of view, it can be clearly shown that, nevertheless, the forms of life generally referred to, where we use them, have a distinct existence and a well-marked place in nature. Agassiz¹ has pointed out

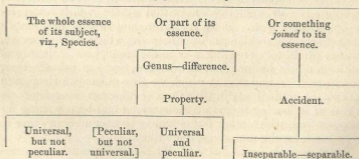
¹ Contributions to the Natural History of the United States, vol. i., p. 28.

how the leading groups of zoology came to be broken up into subordinate divisions, on which all competent naturalists may be held to agree, notwithstanding the multitude of doubtful questions which would be raised, were they to adduce the grounds on which each may have satisfied himself that his conclusions are warranted. Thus, in radiata, "polyps would be placed lowest, acalephs next, and echinoderms highest; a similar arrangement of molluscs would bring acephala lowest, gasterepoda next, and cephalopoda highest; articulata would appear in the following order: norms, crustacea, and insects; and vertebrata with the fishes lowest, next reptiles and birds, and mammalia highest." Our object in referring to this is to show that, whatever doubt may exist when observers come to define terms, and to assign reasons for their generalizations, the existences included under these have a sphere in the great scheme of life, which is theirs in virtue of the special arrangements of the Creator, and beyond which they cannot pass. The interpreters of nature of one generation may make mistakes which their successors in another may be found qualified to correct; but it does not augur the possession of much wisdom, for any one to find in the error a vindication of doubt as to the existence of any such plan in creation as the aggregation of unquestioned phenomena demand. Cuvier had assigned a distinct class to the barnacle under mollusca, but it is now ranked in crustacea under articulata. The removal from the former to the latter should not surely incline any observer to the conclusion, that because Cuvier made a mistake as to the place of the cirripeds, he has not discovered the plan of the Creator in connection with other divisions of the mollusca! On the contrary, these modifications in arrangement as science advances, afford us the strongest evidences that we are rightly interpreting the Divine plan. It is, moreover, one of the most deeply interesting studies which can be followed by a thoughtful observer, to trace the history of opinion as to the true place in nature of one form of life and another, to note the great gap between their present position and that at which we first meet with them, and to mark the gradual way in which most competent observers come to concur in leaving them in a niche which had been waiting for them, or from which other forms had to be excluded, in order to make room for the pre-ordained occupant.

There is little doubt but that Mr Darwin is much impressed with the difficulty of giving a verbal definition of species which will satisfy every one. This doubt has cast its shadow over the individual form of life itself, to which the name and rank of "distinct species" has been assigned; and he has virtually come to occupy the Lamarkian point of view, and to regard the doc-

trine of the immutability of species as the dead fly in the precious ointment—the error which vitiates all nineteenth century scientific generalizations. Our readers will have seen that we have no great desire to demand a definition which shall be beyond cavil. This, we believe, men with Mr Darwin's views renders impossible, because they constantly introduce a foreign element. Not satisfied with what is essentially characteristic, they raise the question of origin; and this, as might be shown, influences all their inductions, if such a word may be used with reference to discussions strung so closely together as are those in this work.¹ All that we care for, in speaking of species, is the presence of such a thought of distinct and unchanging individuality as every naturalist has, when, for example, in looking at the European Falanidæ, he characterizes *Falco gyrfalco* (Linn.) as one species, and *Falco tinnunculus* as another, or, when classifying the British Corvidæ, he marks *Corvus frugilegus* as originally and persistently separate from *C. monedula*, or *Garrulus melanoleuca* from *G. glandarius*. This distinction has, by Cuvier, Owen, and, indeed, by all the ablest zoologists, been associated with the creation of species. They continue distinct, because, to use the words of Professor Dana, "the specific amount or condition of concentrated force defined in the act or law of creation," has continued till now as it was at the beginning. This has set bounds to intermixture hitherto, and all that we know of the past warrants the conclusion, that spe-

¹ Such writers might study Archbishop Whately's elementary work on Logic with advantage. Many of the principles briefly stated in it are as deeply interesting to naturalists as they are to psychologists. Take the following on *Species*, *Genera*, and *Differentia*:—"Every predicable expresses either



Any naturalist can apply this formula to beast, bird, reptile, fish, or insect. He will find it helpful in giving precision to his thoughts, in tracing those inseparable marks in form and structure, which originally established the claim of certain individuals to be ranked as *species*; the differentia associated with genera will indicate the propriety of the term *genus*, as his sphere of observation widens, and the accidents will enable him to assign their true place to *varieties* in species. The remarks on "Definition" are equally worthy of attention. See Logic, Book II, chap. v., § 3 and § 6.

cific identity will continue in the future. Even Mr Darwin has not been able to adduce one fact directly in the face of this. And in so far as his theories of families now widely differing ever having been one, we will credit them when we behold his plain possibilities drawing even remotely in the direction of the threshold of that which is probable;—when we see some tapir caught in the act of becoming a horse, and some ambitious whale sprawling up to the dignity of a polar bear,—transformations which seem quite easy to Mr Darwin, to whom Ovid's "Ascalaphus in Bubonem" must appear tame, the "selection" being removed from the "natural," and made to turn upon the less noble "divine choice," and the powerful agencies of the unseen world:—

"——Sparsumque caput Phlegethontide lympha
 In rostrum, et plumas, et grandia lumina vertit.
 Ille sibi ablatus fulvis amicitur ab alis,
 Neque caput crescit, longosque reflectitur ungues,
 Vixque movet natas per inertia brachia pennas:
 Fœdaque fit volucris, venturi nuntia luctus,
 Ignavus bubo, dirum mortalibus omen."

It appears scarcely probable that Mr Darwin can seriously believe any great number of men will be found willing to accept the long list of assertions and suppositions contained in the opening chapter on "Variation under Domestication," as of any value in the argument. The assertions are, no doubt, backed by alleged facts; but almost every one of these "facts" gives occasion for a controversy, and the suppositions are held to be strengthened by the discoveries and observations of others. But the worth of these may be understood when we affirm, that Mr Horner's Nile-mud hypothesis is one of them. Besides, were the views brought out in this chapter all founded on facts which could not be questioned, they would not contribute anything to the strength of Mr Darwin's positions as to "Natural Selection." They are all associated with the presence of man's intelligence. The plants and animals are under his care. He is ever observant of occurring exceptional features, by watching over which he may gratify his taste for variety, and add to the number of existing forms, as evidences of his power, to a certain well-defined limit, over the creatures put under him. Admit the full play of man's intelligence, and we will agree with much affirmed by Mr Darwin as to the marked characters of varieties. But apart from this, it is not within the range of our belief, that, even though you assign a personality to "Nature," while you banish God from the scene, this, to some all-potent, *she* would be equal to these results. Of course, if Natural Selection has been at work up through the great ages which are represented by the fossiliferous rocks lying between the first layer of the lower Silurian and the last of the

Pleistocene, Dame Nature must have done all; and to bring in man's influence as the same in its results as hers, is to spoil the argument. In this chapter on variation, when alluding to reversion to original types, Mr Darwin says:—"Having alluded to the subject of reversion, I may here refer to a statement often made by naturalists, namely, that our domestic varieties, when run wild, gradually, but certainly, revert in character to their aboriginal stocks. Hence it has been argued, that no deductions can be drawn from domestic races to species in a state of nature. I have in vain endeavoured to discover on what decisive facts the above statement has so often and so boldly been made. There would be great difficulty in proving its truth; we may safely conclude that very many of the most strongly-marked domestic varieties could not possibly live in a wild state. In many cases, we do not know what the aboriginal stock was, and so could not tell whether or not nearly perfect reversion had ensued. It would be quite necessary, in order to prevent the effects of intercrossing, that only a single variety should be turned loose in its new home. Nevertheless, as our varieties certainly do occasionally revert, in some of their characters, to ancestral forms, it seems to me not improbable, that, if we could succeed in naturalizing, or were to cultivate, during many generations, the several races, for instance, of the cabbage, in very poor soil (in which case, however, some effect would have to be attributed to the direct action of the poor soil), that they would, to a large extent, or even wholly, revert to the wild aboriginal stock. Whether or not the experiment would succeed, is not of great importance for our line of argument; for, by the experiment itself, the conditions of life are changed. If it could be shown that our domestic varieties manifested a strong tendency to reversion,—that is, to lose their acquired characters whilst kept under unchanged conditions, and whilst kept in a considerable body, so that free intercrossing might check, by blending together, any slight deviations of structure,—in such a case, I grant that we could deduce nothing from domestic varieties in regard to species. But there is not a shadow of evidence in favour of this view: to assert that we could not breed our cart and race-horses, long and short-horned cattle, and poultry of various breeds, and esculent vegetables, for an almost infinite number of generations, would be opposed to all experience."—P. 14.

It might be difficult to gratify Mr Darwin as to the desire expressed in the last part of the extract now made; but we believe reversion to type, when domesticated animals are left to become wild, is capable of very varied and copious illustration. In the former case, nature—to use a favourite word with our author—nature is found ever ready to remind us of the original

plan. We know of a case in which a peculiarly marked Spanish ram was mated with a Southdown ewe; and after several years' breeding in-and-in, a well-marked variety was obtained, which appears to have become permanent,—under one condition, however, for in the case of a cross the characteristic marks are at once lost. Yet, even while keeping the strongly-marked variety apart, ewes which drop two lambs are sometimes found to have given one to the world the perfect image of the original sire. The variety which interbreeding preserves is invariably brownish black, with constant white lines on the face. May not those cases, which periodically occur among the negroes of Africa, of fair complexion and flowing locks, be nature's reminder of original type? We do not refer to Albinos, which Livingstone and others have met in circumstances where they would have least been looked for, but to varieties much more like the Caucasian type. We give in a foot-note a suggestive fact in regard to goats.¹

As to the reversion to original type, when animals now domesticated by man are suffered to run wild, Pritchard, in his valuable "Natural History of Man," gives us some interesting examples:—"The original stocks of our domesticated animals," he says, p. 27, "are rarely to be recognised, in their primitive state, among the wild animals of the earth. We know not what

¹ "The great utilizer of alpaca wool, Mr Titus Salt, is likewise the man who has given a greater impetus to the trade in Angora goats' hair than any other person in the United Kingdom. He has, moreover, imported the animals themselves (in 1852), and they are thriving well on his property at Bradford. But here again our far-sighted American cousins are considerably ahead of us; for in 1849, Dr James B. Davis of Columbia carried with him, from their native habitat, seven females and two males of this breed of goat to the United States. Immediately he arrived at his home, he obtained a number of she-goats of the common breed (worth about three shillings each), and crossed them with his Angora variety, obtaining, even in the first cross, a coat of fine hair, whereas the third cross could not be distinguished from the pure breed.

"Now, it is to this most valuable and interesting experiment that I would call particular attention; for I have seen its results, and can bear witness to its complete success. During a week's visit to the gentleman in Georgia (U.S.) who bought up Dr Davis' flock, I had ample opportunities of inspecting them most minutely, and I assert, that nothing could exceed the vigour and healthfulness of these animals, both the pure and cross breed.

"Professor Bachman inspected this flock just after my visit to them; and in a report published by him on the subject, he says: 'Familiar as I have been, through a long life, with the changes produced by crosses amongst varieties of domestic animals and poultry, there is one trait in these goats which is more strongly developed than in any other variety that I have ever known. I allude to the wonderful facility with which the young of the cross between the male of the Asiatic goat and the female of the common goat assumes all the characteristics of the former. It is extremely difficult to change a breed that has become permanent in any of our domestic varieties, whether it be that of horses, cattle, sheep, or hogs, into another variety by the aid of the male of the latter, for there is a tendency to run back into their original varieties; hence the objection to mixed breeds. But in the progeny of these Asiatic and common goats, nine-tenths of them exhibit the strongest tendency to adopt the characteristics of the male, and to elevate themselves into a higher and nobler grade.'"

has become of them, unless it be supposed that they have been wholly subdued by man. There are indeed wild oxen, sheep, goats, horses; but the most of these are tribes which appear to have returned, in some degree, to their original state, after having been more or less completely domesticated. We are ignorant of the time and circumstances under which most of these races became wild, and of the particular breeds from which they descended. There is, however, one great field of observation, in the tribes of animals which are known to have been transported from Europe to America, since the discovery of the western continent by the Spaniards in the fifteenth century. Many of these races have multiplied exceedingly on a soil and under a climate congenial to their nature. Several of them have run wild in the vast forests of America, and have lost all the obvious appearances of domestication. The wild tribes are found to differ physically from the domesticated breeds from which they are known to have issued; and there is good reason to regard this change as a restoration, in part, of the primitive characteristics of the wild stocks from which the tamed animals originally descended." Mr Pritchard illustrates these remarks by facts drawn from a paper by M. Roulin, published among the "*Contributions des Savans Etrangeres*," in the memoirs of the French Institute. Hogs were first introduced into the Spanish settlements in 1493. They multiplied so rapidly, that man gradually left them to their own habits. In St Domingo they overran the country, and had to be hunted down. On the continent they took to the vast forests, and resumed the mode of life which belonged to the original stock; and now "their ears have become erect, their heads larger, and the foreheads vaulted at the upper part; their colour has lost the variety found in the domestic breeds; the wild hogs of the American forests are universally black. The hog which inhabits the high mountains of Paramos bears a striking resemblance to the wild boar of France. . . . The restoration of the original character of the wild boar, in a race descended from domesticated swine, removes all room for doubt, if any had really existed, as to the identity of the stock."—P. 31. The same line of remark is continued by Mr Pritchard with reference to oxen,¹

¹ The following supplies another hard nut to crack:—"A very remarkable fact relative to the oxen of South America, is recorded by M. Roulin, to which M. Geoffroy St Hilaire has particularly adverted, in the report made by him on M. Roulin's memoir before the Royal Academy of Sciences. In Europe, the milking of cows is continued through the whole period, from the time when they begin to bear calves till they cease to breed. This secretion of milk has become a constant function in the animal economy of the tribe; it has been rendered such by the practice continued through a long series of generations, of continuing to draw milk long after the period when it would be wanted for the calf: the teats of the cow are larger than in proportion, and the secretion is perpetual. In Columbia, the practice of milking cows was laid aside, owing to

dogs, gallinaceous fowls, etc.; but we cannot afford more space for extracts.

In looking at man's power in modifying species, we are far from believing that Mr Darwin's conclusions drawn from this are warranted. All he has made out, is a necessity for the introduction of a term into the nomenclature of science, which has been too much overlooked by working naturalists, namely, "Permanent Varieties." Not indeed that he feels the need of this term; but his facts and assertions will suggest its importance to many of his readers. The recognition of this will do good work in clearing the ground, and in exposing the danger there is in that amiable weakness, of hastening to rank as distinct species what are only varieties, in order that the finder's name might be associated with them. Thus we would say, 'Species are immutable, Common Varieties are short-lived and ever changing, and Permanent Varieties, gained by man's selection, or through climatal influences, but mainly by cross or interbreeding, or breeding in-and-in, perpetuate themselves so long as the accidental circumstances in which they originated continue. Removed from these, there will be a reversion to the original type.'

Mr Darwin's admission of a difficulty, which however we do not think called for, in regard to the dog is important, when looked at in the light of the remarks made on domesticated pigeons. It appears to us that the same grounds which lead him to demand a plurality of original types for the dog, should have weighed with him as to the pigeon. He holds the rock pigeon (*Columba livia*) to be the parent of all our domestic pigeons; but as this might have shut him up to orthodox views in regard to other animals, and especially as to man when he shall come boldly to apply his theory to man, he claims for domestic dogs several wild ancestors. M. Frederick Cuvier and many other

the great extent of farms, and other circumstances. 'In a few generations,' says M. Roulin, 'the natural structure of parts, and withal the natural state of the function, has been restored. The secretion of milk in the cows of this country is only an occasional phenomenon, and contemporary with the actual presence of the calf. If the calf dies, the milk ceases to flow; and it is only by keeping him with his dam by day, that an opportunity of obtaining milk from cows by night can be found.' This testimony is important, by the proof which it affords, that the permanent production of milk in the European breeds of cows, is a modified function of the animal economy, produced by an artificial habit, continued through several generations."—Pritchard, p. 34. In a word, not only is there a constant readiness to return to the natural type in structure and in ornamentation, but in habits also. So long as man is present to guide artificial habits, they continue persistent; but, due time being allowed, they will cease when the animals are left uncared for. Man's influence over the dog has guided instinct into channels useful to himself; and the influence, again, of this artificially taught instinct on the physical frame of the dog, is well seen in the pointer. The pup will point when first taken into the field; but in a few generations its descendants, if untrained, will cease to do this.

most accomplished naturalists are at issue with Mr Darwin on this point. Their views harmonize with his as to inherited variation, so far as he is willing to allow this; but they go much further, and hold that, as in the case of *Columba livia* it is not unlikely we have the parent of the varieties of domestic pigeons, so our widely differing varieties of domestic dogs may have had only one parent species. If the carrier pigeon, the tumbler, the bald, the powder, the fantail, the beard, the jacobin, the runt, the dragoon, etc., are to be regarded as descended from different original wild ancestors, then we are right when we assign to them the name of species; but if they are from one, as we believe, with Mr Darwin, they are, we must characterize them not as species, but as permanent varieties, whose wide divergence from the original type is impossible without the interference of man. So, as to domestic dogs, we hold with M. Frederick Cuvier that they have descended from one pair; and that, in virtue of man's power over them in selection, in cross or inter-breeding, or breeding in-and-in, the Italian greyhound, the bloodhound, the bulldog, the Blenheim spaniel, etc., have become permanent varieties. This will account for their fitness for cross-breeding. But can we, as in the case of pigeons, point out the common wild ancestor? The impression that an answer is necessary has shut up some to claim the fox, others the wolf, and others the jackal, as the wild ancestor of the domestic canidæ. But no answer is needed in order to give force to our remarks. The original type may be lost,—the species which was not selected from any type of life bearing some resemblance to it, but which came fresh from the hands of the Creator, may not exist in any one living variety, but may have its perfect antitype in peculiarities persistent in each. It is so with man. The most devoted advocate of the proximity of the Caucasian type to the pair who walked in beauty and in bliss amidst the bowers of Eden, is not so extravagant as to claim that in this race we have all the characteristics of the first man. In this case the Adamic type has been lost, and in the great diversities of families we have permanent varieties of the one species, yet all having part in the one blood relationship constituted by the Creator himself. The facts here referred to are being brought out under our own eyes. The sexual intercourse between the early Dutch settlers in South Africa and the Hottentot women has given a new variety of man to that country—the *Griquas*—whose children do not follow the likeness of either of the original parents, but of their offspring. The variety has become permanent. Such is the case also with the half-breeds in the Hudson's Bay territories. The union of native South Americans with negro women imported from Africa has resulted in a distinct tribe—the *Cafucos*—whose chil-

dren are habitually born with the mixed likeness well defined. Pritchard, in his chapter on mixed races, gives many more examples. As an illustration of the influence of artificial selection and interbreeding, we may refer to the well-known otter breed of sheep of Massachusetts, which in questions of this kind has been so often referred to. "In the year 1791," says Pritchard, "one ewe on the farm of Seth Wright gave birth to a male lamb, which, without any known cause, had a longer body and shorter legs than the rest of the breed. The joints are said to have been longer, and the fore-legs crooked. The shape of this animal rendering it unable to leap over fences, it was determined to propagate its peculiarities, and the experiment proved successful: a new race of sheep was produced, which, from the form of the body, has been termed the otter-breed. It seems to be uniformly the fact, that, when both parents are of the otter-breed, the lambs that are produced inherit the peculiar form."—Pritchard, p. 46. It will be seen, however, that in such cases man's selection is necessary in order to ensure success. Had the lamb which the Massachusetts farmer made so much of, been left to his own sweet will in choosing a partner, he would have followed an instinct of whose controlling influence we have so many illustrations among those men who have not been lavishly dealt with as to size and form; he would have picked out for himself the fairest of the flock. Natural selection would thus have been all in the direction of keeping near to the original type. That this is always the result, when animals are not interfered with, we believe to be capable of varied illustration. One example we may give out of many:—For a couple of years a blackbird frequented our garden, whose motions bore evidence of deformity, and whose colour was suggestive of present disease. The skin is now before us. The feathers of the neck and hind-head are white, and the metatarsal joint of the right foot has become stiff, while the foot is bent up, and a stump is in the place of the foot. When examined after being taken, we found that the last joints of the cervical vertebra gave clear evidence of having been for some time in decay (caries). Had man wished to transmit the disease of the male, he would have sought for a diseased female—for one whose physical features approached in likeness to the male—but the bird, in mating, took to himself a healthy female, and the brood followed the likeness of the mother in each case except one, in which one of the tail feathers was pure white. Yet, distinctly marked as man's influence in these cases is, there are limits beyond which he cannot go, and all his efforts must be directed mainly from one point of view. He may add to distinguishing features in ornamentation, or even in some aspects of structure, but he cannot destroy or even modify any original structural

peculiarities associated with the propagation of the race. The oldest experiment in this direction which is to be found in the world—an experiment repeated for thousands of years, and in millions of cases—is suggestive on this point. The Jewish male child suffered mutilation in circumcision, but this has never become hereditary.

Before leaving the “facts” in this part of Mr Darwin’s book, we may remark that it is not true that “the plantigrade or bear family do not breed freely in this country in confinement.” One species, with whose history and habits we are acquainted—the *European brown bear*—breeds freely in this condition. The reference to Mr Horner’s discoveries (?) is not fortunate. Does Mr Darwin believe that Mr Horner has made out a claim even to attention for his speculations? If so, we can only hope to be kept from his easiness of belief. While we have accepted the statement of probability as to *Columba livia* being the stock from which our domestic pigeons have come, we are not unmindful that as good a case might be made out for other wild varieties of *Columbæ*. The likelihood here, as in the case of the dog, is, that we must look for the primeval type in peculiarities which have a place in individuals of all existing varieties. We accept, too, the fact of great capacity of variation in certain domestic animals and in certain plants, but we would not hence conclude that all animals and plants are equally susceptible of influence in this way. The dog is peculiarly so, the cat is not; the horse is, the donkey is not; the barn-door fowl is so, the goose is not. All that can be said in such instances is, that there are certain forms of life more susceptible of influence from man than others. But when Mr Darwin seems about to receive such views, observe how skilfully, if not adroitly, he leaves a contrary impression in the mind of the trusting reader. “We cannot suppose,” he says, “that all the breeds were suddenly produced as perfect and as useful as we now see them; indeed, in several cases, we know that this has not been their history. The key is man’s power of accumulative selection: *nature gives successive variations*; man adds them up in certain directions useful to himself. In this sense he may be said to make for himself useful breeds.” The *successive variations*, however, which are nature’s free gift to us, are just what we wish proof of. Again, is it a fact, as Mr Darwin alleges, that even his favourite “pigeon argument” warrants the conclusions which he has come to in conducting it? Has man’s intelligence gone out in seeking variation by selection only? If the author had only given us a few facts from his treasures in reserve, which tell only one tale, we would have felt obliged. But he has not done this, and we are left to seek out the truth for ourselves. After more than twenty years’ observation in

regard to pigeons, we are shut up to acknowledge the influence of cross-breeding in modifying structure, and in varying ornamentation, to an extent which is destructive of the conclusions from Mr Darwin's "facts." So is it with cattle. Cross-breeding, and breeding in-and-in, under man's watchful care and discriminating intelligence, can alone give the key to variation.

If Mr Darwin hoped, by putting variation under domestication in the front of his romance—for the work is really such—to gild the pill of "variation under nature," which, in Chapter II., we are required to swallow, he has fallen far short of his aim. The theory here put forward is this—species are not immutable. Realized in the world somehow, they have been ever changing in the march of life, from the lowest stratum of the palæozoic rocks up to yesterday; they have, at one point and another, passed into forms widely different from those that preceded them. Organisms have gradually changed, and the mode in which the strange mutations have been brought about has been by natural selection,—*i. e.*, Nature constantly watchful for peculiarities resulting from food, climate, monstrosities, and the like, has ever been selecting the hap-hazard result, and guiding it until a form, which shall seem to be persistent through a lengthened period, is fairly ushered into the sunlight. In this theory the author meets with both the power and the weakness of Nature. His goddess has power to select the variety when produced, but she has no power to produce the distinguishing feature. She sees the polar bear imprisoned in the basin, up whose ice walls he cannot climb, indebted to another deity, "Chance," for his position; and looking complacently on, she says, "Here is something for me. In a neighbouring basin lives a female, which has been longer imprisoned, and in its pursuit of water-insects it has already begun to think it most convenient to try and become a whale. I will watch for the breaking up of the ice wall which separates the two. The influence of this constant swimming has already begun to tell. Well-marked peculiarities are making their appearance; the two shall breed and perpetuate the distinguishing feature; the young will have a starting-point in advance of the parents; their offspring will get yet nearer to the true cetacea, and in time—what though the ages must be reckoned by millions—I will have the satisfaction of introducing a new form, and my domains shall be honoured by the presence of whale!" That this is no caricature of the author of "The Origin of Species by means of Natural Selection," will be evident from his own words, with which our readers must be amused, if indeed a sadder feeling does not fill their hearts when they remember that the writer prepared the admirable monograph for the Royal Society on Cirripedes. "In North America," says

Mr Darwin, "the black bear was seen by Hearne swimming for hours with widely open mouth, thus catching, like a whale, insects in the water. Even in so extreme a case as this, if the supply of insects were constant, and if better adapted competitors did not exist in the country, I can see no difficulty in a race of bears being rendered, by natural selection, more and more aquatic in their structure and habits, with larger and larger mouths, till a creature was produced as monstrous as a whale."—P. 184. Such credulity will find no difficulties. Could we only get up, or rather down, to the same platform, we could at once believe that the sauroid fishes were not prophetic types of reptiles, but their true ancestors, from which they have been gradually selected, and that every bird has for its common parent *Pterodactylus crassirostris!* Natural selection is, as we have seen, believed by Mr Darwin to be equal to far more wondrous changes than these, and in his hands will easily explain the origin of *Pterodactylus* itself. But the author's account of the process would be only half as satisfactory as that given by the blackbird, in the old ballad, of the cause of his putting off the gayer plumage of the song-thrush:—

"Said the blackbird, as he fled,
I loved a maid, but she is dead;
Ever since my love I lack,
And this is why I mourn in black."

The chapter on natural selection contains some of the most important statements in the book. These are stated in an off-hand way, and they read so pleasantly that we don't wonder they have been found attractive and unanswerable by amateur naturalists. Our remarks on species have already met some of these statements. Referring to variations, Mr Darwin says, "They affect what naturalists consider unimportant parts; but I could show, by a long catalogue of facts, that parts which must be called important, whether viewed under a physiological or classificatory point of view, sometimes vary in the individuals of the same species." Instead of treating us to one out of the "long catalogue," he refers to Mr Lubbock's examinations of the cochineal insects, and says he has found in their main nerves a "degree of variability, which may almost be compared to the irregular branching of the stem of a tree." Without looking at Mr Lubbock's researches, or passing an opinion on them, though they are variously estimated, we must ask for some of the facts referred to in the long catalogue, and then we can estimate their value in connection with the variations noticed in the main nerves of coccus. Meanwhile we accept the important admission contained in the following sentence: "Authors sometimes argue in a circle when they state that important organs never

vary, for those same authors practically rank that character as important which does not vary; and under this point of view, no instance of an important part varying will ever be found."—P. 46. If our readers will free Chapter II. from the garb of science, under which "Natural Selection" is introduced to the consideration of good society, they will find much to call up a smile at its absurdity, and a good deal to call forth their regret that one with Mr Darwin's talents should have lent himself to spread views of creation whose tendency is to bring the presence and superintending power of the Creator into contempt.

Much has already been written on the "Struggle for Existence," described by Mr Darwin in Chapter III. It has been characterized as "a most remarkable chapter," even by such a clear-headed and accomplished writer as Professor Huxley. It is most remarkable indeed, but neither from its depths, nor its discrimination, nor its just views of the great scheme of life. In the opening page the author asks, "How have all those exquisite adaptations of one part of the organization to another part, and to the conditions of life, and of one distinct organic being to another being, been perfected?" The answer hitherto rendered by all but charlatans in science has been, 'by the Creator, whose work is perfect.' Mr Darwin finds the answer in another quarter. He introduces another of his deities thus—"All these results follow inevitably from the Struggle for Life."—P. 61. With equal force it might be alleged that Mr Darwin's book is the cause of the zoological arrangement in the British Museum.

The whole of this chapter, in which one hears only an

"Universal groan,

As if the whole inhabitation perished!

Blood, death, and deathful deeds

Ruin, destruction at the utmost point,"¹

has been written from the point of view of unbelief in the governing Creator. It proceeds, moreover, on an entire misapprehension of the economy of nature, and, to use an expressive remark of Coleridge, its seeming depth is only darkness. The shadow cast over life comes from Mr Darwin's figure as he moves along, seeing only death everywhere. Let us look a little deeper, and we will find this so-called struggle for existence richly suggestive of the goodness of God. One animal preys upon another, but the effort is not to destroy utterly, but rather to fulfil a law of their nature, which results in maintaining the balance of life. The death is in order to life. The strigidæ glide forth from ruined wall, decayed tree, and ivied tower, when twilight comes, and with glancing eye and soft wing they sweep over the fields, across the

¹ Samson Agonistes.

moss-covered openings in our woods, and prey upon mouse, and shrew, and vole. In a pellet of *strix flammea* we found, the other day, no fewer than six heads of *arvicola agrestis* (our common field vole). The destruction is constant, and on a large scale. But this gloomy "Struggle" need not be hauled in on the shoulders of hypothesis to account for it. Owls must be fed, nature supplies the food. But field mice also require sustenance. Their food, however, is closely connected with that of man, and they need to be kept in their proper place. Hence the owl's province. The line of thought might be followed into a hundred different relations, and in each one of them we would be led to acknowledge wisdom, perfect wisdom, and goodness, perfect goodness, as characteristic of the arrangements by which the balance of life is maintained. Does the elm in the well-kept park hasten to produce its millions of seeds only that it might choke the evergreens planted beyond its shadow, but whose rootlets are beginning to interlace with its own? Is there a struggle between the elm and the bay. That flock of green linnets tells the tale of the large supply of seeds; the bold dash of the sparrow-hawk into the midst of them, and his rising upwards with a linnet in his claw, lets light in upon yet another feature of "the struggle." But species perish; forms of animal life and of vegetation are lost; localities in which certain creatures were once abundant are, in the course of time, deprived of them: in the district where we write, the *glead* (*Milvus Regalis*) is known to have at one time been common, but the last seen in it, and it even was accounted a great stranger, occurred more than twenty years ago. This bird, once common in Scotland, is now very rarely to be met with. Now, without being shut up to Mr Darwin's grand discovery of "the struggle for existence," we think we have perfectly satisfactory ground to rest on, when we say that such and such forms now extinct had served their day. They had played their part in the great Creator's plan, and He permits agencies to come into action by which their destruction is gradually realized. The outstanding thought, nevertheless, is not struggle for existence, but both existence and death in order to the highest ends in maintaining life. This dreary discourse of our author, so full of morbid views of creation, suggested to us again and again, Richter's expression in his grand dream—it looks as if Mr Darwin believed, or, like the German, dreamed "that God was dead."

A word as to the facts in this "most remarkable chapter." If two seedling misletoe plants spring up on the same branch of an apple tree, we are told there will be a struggle for existence. Of course, because the design of the Creator is, that the misletoe seedling should grow to maturity as a healthy plant, and He carries out His design. The seed which had the start in springing, will,

ceteris paribus, ultimately destroy the other. Certainly not in order to death, but to life—"more life and fuller"—in a word, in order to the propagation of the species. Of two rats shut up in a cage, one will destroy the other, because it seeks to live in order to fulfil the law of propagation, under which every form of life was put when the word "multiply" was given. So with a piece of ground: scatter a number of different kinds of seeds, and there will be a struggle. Those which find the chemical character of the soil most suitable to their nature, will destroy the others, and ultimately the weaker members of their own family, that room may be left for their fulfilling the law of their creation, in bearing seed after their kind. The victory does not necessarily turn in favour of the stronger. The character of the soil has much to do with it. We have seen the furze (*Ulex Europæus*) yield to a vigorous crop of oats in land newly broken up. The balance of life testifies at every point to the presence of an Almighty Preserver. How different the results when man interferes! Let a sportsman wall in his fields, and preserve his game from every intruder, and he will find that the exclusion of nature's mode of keeping all things right will lead to wholesale death. Should a gardener take it into his head to shoot every bird as a nuisance, he will soon discover, to his cost, that his fruits may have worse enemies than the birds. Mr Darwin wishes everything to go on in the most orderly way, in connection with this struggle. He has a great dread of sudden and violent action. Thousands of years of slowest process are his delight, and he has a special pity for the "profound ignorance and high presumption" (p. 73) of naturalists who, because they know no better, "invoke cataclysms to desolate the world, or invent laws on the duration of animal life." We suppose, however, that a cataclysm, like the Lisbon earthquake, might be within the range of belief, as at least possible in the region of the Dodo, and if so, a flock *might* have perished in it.¹ If Mr Darwin knew a little more geology, he

¹ Some of the "facts" in this chapter are characteristic. "No bee but the humble bee visits *viola tricolor*?" "In some parts of Scotland the increase of the messel-thrush has caused the decrease of the song-thrush?" "Hive-bees cannot get at the nectar in the corolla tubes of *trifolium pratense*, "because of the shortness of their proboscis." Did it not cause astonishment, when Mr Darwin recollected that the hive-bee has been side by side with the red clover for thousands of years, and yet its attempts to get at the nectar have not resulted in giving greater length to its proboscis? Is not this as unpliant on the part of said proboscis to witness to the truth of Mr Darwin's theories on the influence of habit, as it is on the part of the neck of the Teal. The constant habit of searching for food in the mud, it is alleged, has given the length of neck to goose and swan. How *boschas crecca* has missed a long neck, must be accounted for by the presence of a certain persistent obduracy in its cervical vertebrae. But the Teal may be on the way to a neck proportionally as long as that of the Swan. We need to give the species a million or two of years more, and the form of man to be alive at that time, will see another proof of the wisdom of his ancestors. Ere then, our water rats shall have been selected into ducks, our ducks to geese,

might still hold Sir Charles Lyell's views of general physical action, and yet leave more room in his creed for the much suspected cataclysms. His devotion to the imperfection of the geologic record, might also incline him to acknowledge the possibility in after ages of remains of, say *Myrtus communis*, being found in only one or two spots. The geologic record supplies many analogies, but the inference that their geographical range had been limited to these would not be a very sound one. Where will the half gods, up into whom the after ages are to find men "selected," find the leaves and stalks of *Myrtus communis*? Nature has begun its work of preserving them. Its cabinet is the tuff of volcanos now active, and whether or no there have been cataclysms associated with its deposition, the accounts of the action of Vesuvius and Etna within the historical period will testify.¹

As Mr Darwin proceeds in developing his theory, his imagination comes more and more out as the foundation on which it rests. Here is a picture curiously interesting both to the naturalist and to the poet. A throne is set somewhere, above Olympus, and the goddess of the author's devotion is seated on it. How employed? "It may be said," answers the author, "that Natural Selection is daily and hourly scrutinising, throughout the world, every variation, even the slightest; rejecting that which is bad, preserving and adding up all that is good; silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being in relation to its organic and inorganic conditions of life. We see nothing of these slow changes in progress, until the hand of time has marked the long lapse of ages, and then so imperfect is our view into long past geological ages, that we only see that the forms of life are now different from what they formerly were."—P. 84. Does Mr Darwin believe that there is any other basis for this—we were about to say, *induction*, but it would be dishonouring the word—assertion than that which his imagination supplies? If a man presumes to form grand generalizations in natural science, and repudiates the use of the only legitimate mode of reaching them, he is sure to demand from others the recognition of his opinions, as if they were lawful inductions, and of his wayward and baseless imaginings, as if they were all facts. In the above extract, it will be seen the author is forced to confess that, in the action of natural selection on all existing forms of life, "we see nothing of these slow changes in progress." Did it

our geese to gorillas, and the "dreadful gorilla" will, no doubt, be found acting the part of our Indian Sepoys in the empire of Central Africa, to be held by the giant form of the super-human coming man.

¹ Lists of fossil plants and shells, in the volcanic tuff of Etna, belonging to living species, will be found in Sir Ch. Lyell's paper "On the Lavas of Etna." *Philosophical Transactions*, Part ii. 1858.

not occur to him, that in claiming for his theory the support of the Lyellian theory of physical action in the formation of the fossiliferous rocks, this acknowledgment takes away all warrant. The strong point in Sir Charles Lyell's theory is, that we have evidences of the slow changes in progress, which warrant the inference that the process of nature has been precisely the same in past ages as we see it to be now? We have said that the extract is not without interest to the poet. The "Chance" of heathenism has developed into a higher form. It has not only a purpose, but a consciousness of purpose, and may become the subject for a new epic, as "Natural Selection." She has a fair prospect of a crowd of worshippers among those who, being really what Paul¹ describes them to be, *ἄθροισι ἐν τῷ κόσμῳ*, are glad of any extravagance in their weariness. Lamarck's Man from Oysters, M. Maillet's Parrots from Perch, Brory de Saint Vincent's fifteen original species of Man, Virey's true Brotherhood between the Baboon and Hottentot, Oken's "God is rotatory motion," have all had believers, and "Natural Selection" has already now disciples willing to give a qualified assent. We willingly leave the honour to the select few, and rejoice to stand among the crowd who still worship at a higher altar, and even in a more *rational* way, who see the presence of a personal God in creation, "who is good to all, and whose tender mercies are over all His works."²

. "Since His word all things produced,
 Though chiefly not for glory as prime end,
 But to show forth His goodness, and impart
 His good communicable to every soul
 Freely; of whom what could He less expect
 Than glory and benediction, that is, thanks,
 The slightest, easiest, readiest recompense."³

¹ Ephes. ii. 12.

² We can do no more than glance at the "facts" in this part of Mr Darwin's work. In the propagation of species, he holds that sexual selection (p. 88) will depend on the vigour of the males, or on their possession of special weapons. In gallinaceous fowls, the cock with the longest and sharpest spurs will, in the latter case, be most successful. But, to use Mr Darwin's expression, we could give "a long catalogue of facts," which show that, as among men, so it is with the lower animals,—the whim, the taste, the fancy of the female is to be taken into account. Among birds, we have seen a vigorous female choose a poor, emaciated, more-dead-than-alive male, when she might have taken to her a healthy one. Again, in a time of scarcity of food for wolves, we are told (p. 90) that it is clear the fleetest and healthiest is sure to be selected to resist the effects of the famine. It might be the most cunning, yet the weakest, and the selection would thus be of the bad. "All insects," says the author, "pair for each birth" (p. 96); of several families which do not, we refer to the *ophides*, or plant lice. It is not capable of proof, that *ornithorhynchus* and *lepedosiren* (p. 107) have survived from geological eras, because exposed to less severe competition in the struggle for existence than other forms which have perished.

³ Paradise Regained, Book iii.

In a diagram (p. 117) Mr Darwin illustrates his principles of Natural Selection and of Divergence from remote types. The time required for the amount of divergence to constitute a new species is immense. Tens of thousands of generations are held to be little in the reckoning. The author is not able to point to one example, among existing forms of life, of progress towards change. We may, then, fairly apply the diagram to the geologic ages, whose records are held by him to be very imperfect, and passing from a^{14} to a^{10} , at which an original species A is supposed to have produced three new forms after 800,000 years (!), we come to A itself. Now, it is at this point we ask what lies beyond A, and how does Mr Darwin account for its existence? Until we have an answer to this, it will not do to denounce the principles implied in the "Vestiges," as Professor Huxley has done, as being wholly different from any that may fairly be drawn from this work. We believe there is good reason for affirming that everything which is false, as to the scheme of life in the worthless development theory, is contained in the "Origin of Species," and a great deal in addition which is more mischievous and profane than anything to be met with in the "Vestiges." Were it possible that the terrible alternative could ever be, "receive either the 'Vestiges' or the 'Origin of Species' as containing a scheme of life with which we *must* be satisfied," we would without hesitation choose the former. Both are burlesques on true science; but the "Vestiges" contains views less dishonouring to the Creator, and less antagonistic to common sense, than those met with in the "Origin of Species," and this is affirming much. However low the views of God in the former, there is more respect shown for those great laws of life, which are manifestations of His will, and whose constant regularity we would no sooner question than we would our own existence; but in the latter there is nothing of this. The mode in which illustrative facts are used indicates on the part of the author a bias which, to say the least of it, is very far from becoming in a lover of science. Our references to these must again for want of space be thrown into a foot-note.¹ For the same reason we only mention Mr Darwin's statement of the dif-

¹ The author holds that the Selection will ever tend to elevate the subjects of it. Not only is there no proof of this, but much suggestive of the opposite. Take the diagram, and suppose A to indicate a point in the geologic scale when the triassic rocks were being formed. Selection had brought a form of life up to *Brontozoum giganteum*, whose footprints Hitchcock has described in his "Researches among the Sandstones of the Connecticut Valley." Its foot was 18 inches long, embracing an area of 13 inches square within its outlines; its stride was from 30 to 60 feet; it must have been 12 feet high, and weighed from 400 to 800 lbs. The Selecting process continued from the time of the trias up to the present epoch, and *Brontozoum* ended as an Ostrich at a^{14} , as a Cassowary at q^{14} , as Darwin's Rhea at p^{14} , and as *Apterix* at some other 14 ; the result in

difficulties in the way of his theory. They are profounder and more numerous than he imagines, as at one point and another we have already shown. Those met with, in looking at the question from the geological point of view, are not touched by pleading the imperfect character of the geologic record. Why, it is asked, do we not find in the earth's crust any traces of transitional forms? The lame answer is, that "extinction and natural selection go hand in hand." In other words, traces of the higher forms exist, but the transitional ones, having served their end, are lost! You might as well say that, when in after ages the site of a battle between the Caffres and British shall be disturbed, there will be found only the traces of the superior, conquering race. But it will not do to plead imperfection of the geological record. If any data may be relied on in this question, those supplied to us by the palæontologist may be so. Take, for example, the suite of fossils presented to us at any point in which estuary limestone meets that which had been found in deep sea, and what is the result? You find not only a series of well-marked species, continuing without a trace of transitional tendency from the bottom of the deposit up through fifty or sixty feet; but you also notice that at the point where the fresh water species meet the deep sea ones, they retain their respective characteristics, as well marked as any that may be found where the Forth or the Clyde meets the waters of the sea. We may be permitted to say that the geological attainments of Mr Darwin, if they are fairly exhibited in this work, seem to be limited to a not very extensive knowledge of the literature of geology, read entirely from the point of view of those who hold that there have been no great breaks in the building up of the world, since the Creator first laid its foundations on the floods.

Mr Darwin's remarks on other difficulties, and on transitional varieties, are as little to the purpose as his apology for want of proofs in consequence of the imperfection of the geological record. "Look," he says, "at *Mustela vison* of North America, which has webbed feet, and which resembles an otter in its fur, short legs, and form of its tail; during summer this animal dives for and preys on fish, but during the long winter it leaves the frozen waters and preys like other polecats on mice and land

each case being a less elevated form. All nature might be looked at in the same way, if you admit size and vigour as elements.

Are the birds of islands less bright in plumage than those on continents? (p. 133). We refer to Tennent's "Ceylon" for the answer in the negative.

The theory as to the original type of the horse (p. 164) would meet a ready refutation by attempts at cross-breeding with the zebra, and then breeding in and in.

The reference to the species of woodpecker at p. 184 is peculiarly unfortunate. The bird referred to is not a true woodpecker, but a species of an allied genus, and one whose structure is in harmony with its habits.

animals."—P. 179. Our author need not have gone to North America for an illustration. There is one nearer hand. The common otter (*Lutra vulgaris*), the link between which and the true Mustelidæ is to be found in *Mustela vison*, has its usual habitat in fresh water, but Fleming found that in Zetland it frequently took to the sea. In times of scarcity of food it is known to take to the land. "When fish are scarce, it will assume the habits of the Stoats and Weasels, resorting far inland to the neighbourhood of the farm-yard, and attacking lambs, suckings-pigs, and poultry." Gilbert White's expression¹—"quadrupeds that prey on fish are amphibious"—might have suggested that there is really nothing transitional in *Mustela vison*. We are no more entitled to conclude that in it we have a weasel about, in course of time, to give up rats and mice for fish only, and to forsake the land for ever, than we are to suppose that *Larus argentatus* is gradually getting a dislike for herring, and may be soon expected to become a true land bird, because it spends weeks in spring among arable lands, often many miles from the nearest shore. The webbed foot of *Mustela vison* is shown by its habits not to have been designed to unfit it, in order to the preservation of the species, for spending a few months on land, for which its make otherwise well adapts it. Everything about the domestic cat indicates the correspondence between structure and general habits. We possess one, however, which was wont to walk into an aquarium up to its belly in water, and stand in it while it devoured the golden carp; but we would have been as little warranted to believe from this that here we had a trace of the original habits of the cat, or of those of the form of ancestral life from which Mr Darwin's deity had selected it, as we would have been to hold, that the intense pleasure which most young people have in sea-bathing is a remnant of an old form of life, up out of which man had been selected,—that, in a word, the creature now called man was in bygone ages a whale or a dolphin! The references to the squirrels and the flying lemur are equally valuable! We could have helped the author to something more interesting on this point. Might not Dante's "Vision" have been a reality, and the wondrous form of life which he saw in hell only the true type of *Pterodactylus crassirostris*? Having been selected down to a bat, did it once more get an ambitious thought that resulted in a modification, which ever watchful "Natural Selection" caught at, and set about to make use of in order to gratify "vaulting ambition," and do we now find it as *Galeopithecus*, "whose extremely wide flank-membrane, stretching from the corners of the jaws to the tail" (p. 181), is

¹ Natural History of Selborne.

waiting to be selected up once more to the true membrane which it lost, when the last layer of the lias was being laid down ?

. . . “O what a sight !

How passing strange it seemed. . . .

Two mighty wings, enormous as became

A (beast) so vast. Sails never such I saw

Outstretched on the wide sea. No plumes had they,

But were in texture like a bat ; and these

He flapp'd i' th' air.”

It is true that Dante's being had three heads, but, with Mr Darwin's natural selection, these could readily be merged in one. Besides, there is corroborative evidence that such must have been the original form, to be found in those imaginations of “gorgons and hydras and chimæras dire,” which hanker about the spiritual nature of us all. It is to be hoped, that if *Galeopithecus* is on his way up to this again, that he will have a modification as regards food, as Dante's dragon, whose tastes, by the way, are perpetuated in the cannibals of the isles of the Pacific, had not very loveable appetites.

“At every mouth his teeth a sinner champ'd,
Bruised as with ponderous engine.”

The notice of the Dipper (*Cinclus Europæus*), as a transitional variety, is as little valuable to Mr Darwin's theories as *Mustela vison* or *Galeopithecus*. Its existence, alongside of the true thrushes (*Turdinæ*), and its relation to the ant-thrushes (*Formicarinæ*), with modifications of form which separate it from both, its tail shorter, its bill stronger, its legs thicker, its feathers denser, with an under-coat of down, as in true divers, than those of thrushes,—all suggest distinct specific differences, and not a transitional variety. There are no bristles at the base of the bill, as in *turdinæ* and *formicarinæ* ; its mode of nesting and its eggs differ widely from both. It is just one of those links which will suggest to most another illustration of how closely one form of life may approach to another, while the Creator keeps them as persistently distinct, as He does those furthest removed from each other—the *falconidæ*, for example, from the *syliadæ*. “He who believes,” says Mr Darwin, “in separate and innumerable acts of creation, will say, that in these cases it has pleased the Creator to cause a being of one type to take the place of another type ; but this seems to me only restating the fact in dignified language” (!).—P. 186. Suppose we were not to say this, as indeed we would not, but to say that the structure or instincts of certain members of great types had been so modified by the Creator, as to fit them for habits unlike the general family ?—would this not be as true in science as it is in our acknowledgment of the direct and special arrangement of the Creator ?

Want of space prevents us doing little more than naming the chapters on Instinct and Hybridism.

Mr Darwin is not satisfied with current views of instinct. He holds that "a little dose of judgment or reason often comes into play, even in animals very low in the scale of nature" (p. 208). In the aphid and the ant, the reason, we suppose, is the same in kind as in man; the dose being only very small! The influence of structure on instinct, and the power of organic conditions over it, open a wide field for the discrimination of natural selection. "In our Department," wrote the author of the "*Traité du Physique et du Moral de l'Homme*," in 1802, "when sitting hens are scarce, there is a peculiar custom. A young cock is taken, the plumage is plucked from his breast and belly, rubbed with nettles and vinegar; and while thus irritated, the capon is placed on eggs. He remains on them at first to soothe the irritation. Soon agreeable impressions are begotten, which attach him to the eggs until they are hatched; a species of fictitious mother-love is the result, and this, as in the hens, continues so long as the chickens require his care." Looking at this from Mr Darwin's point of view, one wonders whether there is now, in the neighbourhood of Cognac, descendants of the capons referred to by Cabanis, which, in the male branch, bear about with them traces that the original cocks are being, under the influence of this controlling instinct, selected into hens!

As to Hybridism, we accept the admission made at page 252, "I doubt whether any case of a perfectly fertile hybrid animal can be considered as thoroughly well authenticated." The early recognition of this by the author would have taken more than thirty pages from his book. The sterility of true hybrids affords another evidence of the jealousy with which the Creator regards all attempts to introduce confusion into His perfect plan.

It will be seen what value we attach to the zoological aspects of Mr Darwin's work. But if the zoology be so very far from satisfactory, when we come to the purely geological portion we are made to feel that it is far worse. It is the most feeble part of the volume; and no apology which Mr Darwin may make for it, even in his most insinuating style and greatest smoothness of speech, will ever be reckoned a substitute for the fact, that in that one department of nature in which we have a right to ask the author to show us the proofs, or even the remote corroborations of his theory, not one is to be found. Tracing the fossiliferous deposits, from the uppermost of the tertiary series down to the bottom of the silurian, we are called everywhere to notice the presence of the highest types of the varied forms characteristic of great periods, existing from the introduction of such periods, and keeping their true typical character, until the period

closes, and a new scene, with new distinctive forms of plants and animals, is ushered in. It were needless to go into details, though any working geologist of moderate attainments is equal to the task. The truth is, that if the author has wholly and signally failed to produce even one unquestioned corroborative proof of true transitional variety among present forms of life, he cannot discover material in the geological record for a chapter on transitional varieties in palæontology. But while we shall not ask our readers to survey the fossiliferous deposits, there are two subjects we wish to refer to ere we close. These are the question of breaks in the introduction of life, and the question of miraculous action.

The author exults over the adherence of Sir Charles Lyell to his views. Those who remember the way in which Sir Charles turned the Lamarckian scheme into ridicule, and especially who have read his anniversary address (Geological Society, 1851), may wonder at the change. But Mr Darwin's theory must have been hailed by Sir Charles, the moment its bearings on his cherished views of physical action were seen. Palæontologically, these views were always liable to objection. In the formation of the crust of the earth, all was held to go on quietly, under the gentle influences of constantly acting natural laws. Yet, at the commencement of every great period, you find new species thrust into the scene of being. These were great breaks in the forms of life, evidences of remarkable climatal changes, judging of these by the living things under them, while there were no corresponding phenomena in regard to organic forms. This was not likely. The highly gifted author of the "Principles of Geology" must have felt it to be so. Here, however, is a scheme which, in every point of view, harmonizes the gradual action of physical laws in the formation of the crust of the earth, with the undeniable changes in the living things which peopled it at different eras. Our purpose here is not to review the non-break, continuous theory of Sir Charles Lyell, though we are persuaded that Mr Darwin's work will lead many to reconsider whether they have done well in accepting it, under the weight and authority of Sir Charles' deservedly great name. The question of the presence of miracle, at various points in the history of the earth, is one which has been, with a strange want of logic, almost universally regarded by eminent men with suspicion. Why? We suppose very few, if any, not even excepting Mr Darwin, would be willing to deny that there has been the exercise, at some period of the earth's history, of creative power,—in a word, miracle. But if you acknowledge its presence at any one point, why be suspicious of it, or deny its probability, at any after-point in the history? If in every respect you find,

that what demanded a miracle at A, is again found existing at E, after having ceased to be before it again made its appearance, first at B, second at C, and third at D, is there anything to forbid the conclusion, that at every one of these stages there was miraculous action? One says, it is not God's usual way of working. But we would have needed to have witnessed the change from one well-marked epoch to another, to entitle any one to make such an answer. It would be a waste of power, adds another. But, if intelligence is not to be suffocated in the blackhole of rank atheism, there must have been ten thousand instances of such waste of power in the introduction of new species. This form of answer is even less satisfactory than the other; for it ignores the fact, that with an Omnipotent One there can be no waste of power. But, reply others, you find in the species of successive fauna, very many, with only the slightest differences to distinguish them, and others you find continue through more faunas than one. The answer to both these statements, we believe, is contained in the remarks made in reply to the second objection. We conclude, then, that all geology testifies that species are permanent; that they have continued so under all varieties of influence; and that, in every case, they have been introduced by the miraculous power of a personal God, who is the Almighty and Omniscient One revealed to man in the Bible.

Mr Darwin's work is in direct antagonism to all the findings of a natural theology, formed on legitimate inductions in the study of the works of God; and it does open violence to everything which the Creator Himself has told us in the Scriptures of truth, of the method and results of His working. While in the foregoing remarks we have been careful to deal with the scientific claims of Mr Darwin's book, we have not scrupled to show that we have looked at it also from the point of view of revelation. In both aspects its publication is a mistake. Its author would have done well to science, and to his own fame, had he, being determined to write it, put it away among his papers, marked, "A Contribution to Scientific Speculation in 1720." It would have thus preceded Linnæus and Cuvier, with whom the dawn began to break into the brightness of noon, and might have been found interesting in 1860, as a prophecy of coming Vireys, Brory de St Vincents, and Lamarks. But thrust upon us at this time of day, when science has walked in calm majesty out from the mists of prejudice, and been accepted as a sister by a sound theology, it has reminded us of a word in the oldest and best of books, which we commend to Mr Darwin and his followers: "Shadows as the night in the midst of the noon-day."