

or memorial church, dedicated to those who died and were buried at Ambresbury. It would explain to us why Silbury Hill, erected on a Roman road, should not cover the remains of the dead, but be the attempt of a letterless race to perpetuate the memory of some event, which nothing but a written record could really communicate to future ages. We might surmise that the circle at Rollrich enclosed a holy spot, and know that the stones of Stennis were really the burying-place of some chief. There is, in fact, no winding in the labyrinth through which this thread might not conduct us in safety, and nothing so mysterious that we might not hope by this means to understand it. But to effect this end, explorations must be made afresh, and researches set about in a purpose-like manner, not aimless gropings in the dark, such as alone have yet been undertaken. A more systematic inquiry would repay the exertions of the earnest historical student, for it is the sole method by which we can expect to throw any light on this branch of our national antiquities. What is even more important, it is the only clue that is now likely to be afforded us for unravelling the mysterious wanderings of the races who peopled Europe and overthrew the Roman Empire, whose blood still flows in our veins, and whose feelings still influence every act, public or private, that takes place in the great European family of nations.

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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. London, 1860.

ANY contribution to our Natural History literature from the pen of Mr. C. Darwin, is certain to command attention. His scientific attainments, his insight and carefulness as an observer, blended with no scanty measure of imaginative sagacity, and his clear and lively style, make all his writings unusually attractive. His present volume on the 'Origin of Species' is the result of many years of observation, thought, and speculation; and is manifestly regarded by him as the 'opus' upon which his future fame is to rest. It is true that he announces it modestly enough as the mere precursor of a mightier volume. But that volume is only intended to supply the facts which are to support the completed argument of the present essay. In this we have a specimen-collection of the vast accu-

mulation; and, working from these as the high analytical mathematician may work from the admitted results of his conic sections, he proceeds to deduce all the conclusions to which he wishes to conduct his readers.

The essay is full of Mr. Darwin's characteristic excellences. It is a most readable book; full of facts in natural history, old and new, of his collecting and of his observing; and all of these are told in his own perspicuous language, and all thrown into picturesque combinations, and all sparkle with the colours of fancy and the lights of imagination. It assumes, too, the grave proportions of a sustained argument upon a matter of the deepest interest, not to naturalists only, or even to men of science exclusively, but to every one who is interested in the history of man and of the relations of nature around him to the history and plan of creation.

With Mr. Darwin's 'argument' we may say in the outset that we shall have much and grave fault to find. But this does not make us the less disposed to admire the singular excellences of his work; and we will seek *in limine* to give our readers a few examples of these. Here, for instance, is a beautiful illustration of the wonderful interdependence of nature—of the golden chain of unsuspected relations which bind together all the mighty web which stretches from end to end of this full and most diversified earth. Who, as he listened to the musical hum of the great humble-bees, or marked their ponderous flight from flower to flower, and watched the unpacking of their trunks for their work of suction, would have supposed that the multiplication or diminution of their race, or the fruitfulness and sterility of the red clover, depend as directly on the vigilance of our cats as do those of our well-guarded game-preserves on the watching of our keepers? Yet this Mr. Darwin has discovered to be literally the case:—

'From experiments which I have lately tried, I have found that the visits of bees are necessary for the fertilisation of some kinds of clover; but humble-bees alone visit the red clover (*Trifolium pratense*), as other bees cannot reach the nectar. Hence I have very little doubt, that if the whole genus of humble-bees became extinct or very rare in England, the heartsease and red clover would become very rare or wholly disappear. The number of humble-bees in any district depends in a great degree on the number of field-mice, which destroy their combs and nests; and Mr. H. Newman, who has long attended to the habits of humble-bees, believes that "more than two-thirds of them are thus destroyed all over England." Now the number of mice is largely dependent, as every one knows, on the number of cats; and Mr. Newman says, "near villages and small towns I have found the

nests of humble-bees more numerous than elsewhere, which I attribute to the number of cats that destroy the mice." Hence, it is quite credible that the presence of a feline animal in large numbers in a district might determine, through the intervention, first of mice, and then of bees, the frequency of certain flowers in that district.—p. 74.

Again, how beautiful are the experiments recorded by him concerning that wonderful relation of the ants to the aphides, which would almost warrant us in giving to the aphid the name of *Vacca formicaria* :—

'One of the strongest instances of an animal apparently performing an action for the sole good of another with which I am acquainted is that of aphides voluntarily yielding their sweet excretion to ants. That they do so voluntarily the following facts will show. I removed all the ants from a group of about a dozen aphides on a dock plant, and prevented their attendance during several hours. After this interval, I felt sure that the aphides would want to excrete. I watched them for some time through a lens, but not one of them excreted. I then tickled and stroked them with a hair in the same manner, as well as I could, as the ants do with their antennæ, but not one excreted. Afterwards I allowed an ant to visit them, and it immediately seemed, by its eager way of running about, to be well aware what a rich flock it had discovered. It then began to play with its antennæ on the abdomen first of one aphid and then of another, and each aphid, as soon as it felt the antennæ, immediately lifted up its abdomen and excreted a limpid drop of sweet juice, which was eagerly devoured by the ant. Even the quite young aphides behaved in this manner, showing that the action was instinctive, and not the result of experience.'—pp. 210, 211.

Or take the following admirable specimen of the union of which we have spoken, of the employment of the observations of others with what he has observed himself, in that which is almost the most marvellous of facts—the slave-making instinct of certain ants. We say nothing at present of the place assigned to these facts in Mr. Darwin's argument, but are merely referring to the collection, observation, and statement of the facts themselves :—

'*Slave-making Instinct.*—This remarkable instinct was first discovered in the *Formica* (*Polyergus*) *rufescens* by Pierre Huber, a better observer even than his celebrated father. This ant is absolutely dependent on its slaves; without their aid the species would certainly become extinct in a single year. The males and fertile females do no work. The workers or sterile females, though most energetic and courageous in capturing slaves, do no other work. They are incapable of making their own nests or of feeding their own larvæ. When the old nest is found inconvenient, and they have to migrate,

it is the slaves which determine the migration, and actually carry their masters in their jaws. So utterly helpless are the masters, that when Huber shut up thirty of them without a slave, but with plenty of the food which they like best, and with their larvæ and pupæ to stimulate them to work, they did nothing; they could not even feed themselves, and many perished of hunger. Huber then introduced a single slave (*F. fusca*), and she instantly set to work, fed and saved the survivors, made some cells and tended the larvæ, and put all to rights. What can be more extraordinary than these well-ascertained facts? If we had not known of any other slave-making ant, it would have been hopeless to have speculated how so wonderful an instinct could have been perfected. Another species (*Formica sanguinea*) was likewise first discovered by P. Huber to be a slave-making ant. This species is found in the southern parts of England, and its habits have been attended to by Mr. F. Smith, of the British Museum, to whom I am much indebted for information on this and other subjects. Although fully trusting to the statements of Huber and Mr. Smith, I tried to approach the subject in a sceptical frame of mind, as any one may well be excused for doubting the truth of so extraordinary and odious an instinct as that of making slaves. Hence I give the observations which I have myself made in some little detail. I opened fourteen nests of *F. sanguinea*, and found a few slaves in each. Males and fertile females of the slave species (*F. fusca*) are found only in their own proper communities, and have never been observed in the nests of *F. sanguinea*. The slaves are black, and not above half the size of their red masters, so that the contrast in their appearance is very great. When the nest is slightly disturbed, the slaves occasionally come out, and, like their masters, are much agitated, and defend the nest. When the nest is much disturbed, and the larvæ and pupæ are exposed, the slaves work energetically with their masters in carrying them away to a place of safety. Hence it is clear that the slaves feel quite at home. During the months of June and July, in three successive years, I have watched for many hours several nests in Surrey and Sussex, and never saw a slave either leave or enter a nest. As, during these months, the slaves are very few in number, I thought that they might behave differently when more numerous, but Mr. Smith informs me that he has watched nests at various hours during May, June, and August both in Surrey and Hampshire, and has never seen the slaves, though present in large numbers in August, either leave or enter the nest. Hence he considers them as strictly household slaves. The masters, on the other hand, may be constantly seen bringing in materials for the nest and food of all kinds. During the present year, however, in the month of July, I came across a community with an unusually large stock of slaves, and I observed a few slaves mingled with their masters leaving the nest, and marching along the same road to a large Scotch fir-tree, twenty-five yards distant, which they ascended together, probably in search of aphides or cocci. According to Huber, who had ample opportunities for observation in Switzerland the slaves

habitually work with their masters in making the nest, and they alone open and close the doors in the morning and evening; and, as Huber expressly states, their principal office is to search for aphides. This difference in the usual habits of their masters and slaves in the two countries probably depends merely on the slaves being captured in greater numbers in Switzerland than in England.

'One day I fortunately witnessed a migration of *F. sanguinea* from one nest to another, and it was a most interesting spectacle to behold the masters carefully carrying (instead of being carried by, as in the case of *F. rufescens*) their slaves in their jaws. Another day my attention was struck by about a score of the slave-makers haunting the same spot, and evidently not in search of food: they approached, and were vigorously repulsed by an independent community of the slave species (*F. fusca*), sometimes as many as three of these ants clinging to the legs of the slave-making *F. sanguinea*. The latter ruthlessly killed their small opponents, and carried their dead bodies as food to their nest, twenty-nine yards distant, but they were prevented from getting any pupæ to rear as slaves. I then dug up a small parcel of pupæ of *F. fusca* from another nest, and put them down on a bare spot near the place of combat; they were eagerly seized and carried off by the tyrants, who perhaps fancied that, after all, they had been victorious in their late combat.

'At the same time I laid on the same place a small parcel of the pupæ of another species (*F. flava*), with a few of these little yellow ants still clinging to the fragments of the nest. This is sometimes, though rarely, made into slaves, as has been described by Mr. Smith. Although so small a species, it is very courageous, and I have seen it ferociously attack other ants. In one instance I found to my surprise an independent community of *F. flava* under a stone beneath a nest of the slave-making *F. sanguinea*, and when I had accidentally disturbed both nests, the little ants attacked their big neighbours with surprising courage.

'Now I was curious to ascertain whether *F. sanguinea* could distinguish the pupæ of *F. fusca*, which they habitually make into slaves, from those of the little and furious *F. flava*, which they rarely capture, and it was evident that they did at once distinguish them, for we have seen that they eagerly and instantly seized the pupæ of *F. fusca*, whereas they were much terrified when they came across the pupæ or even the earth from the nest of *F. flava*, and quickly ran away; but in about a quarter of an hour, shortly after all the little yellow ants had crawled away, they took heart and carried off the pupæ.

'One evening I visited another community of *F. sanguinea*, and found a number of these ants returning home and entering their nests, carrying the dead bodies of *F. fusca* (showing that it was not a migration) and numerous pupæ. I traced a long file of ants burthened with this booty for about forty yards to a very thick clump of heath, whence I saw the last individual of *F. sanguinea* emerge, carrying a pupa, but I was not able to find the desolated nest in the thick heath. The nest, however, must have

been close at hand, for two or three individuals of *F. fusca* were rushing about in the greatest agitation, and one was perched motionless with its own pupa in its mouth on the top of a spray of heath, an image of despair over its ravaged home.'—p. 219, 223.

Now, all this is, we think, really charming writing. We feel as we walk abroad with Mr. Darwin very much as the favoured object of the attention of the dervise must have felt when he had rubbed the ointment around his eye, and had it opened to see all the jewels, and diamonds, and emeralds, and topazes, and rubies, which were sparkling unregarded beneath the earth, hidden as yet from all eyes save those which the dervise had enlightened. But here we are bound to say our pleasure terminates; for, when we turn with Mr. Darwin to his 'argument,' we are almost immediately at variance with him. It is as an 'argument' that the essay is put forward; as an argument we will test it.

We can perhaps best convey to our readers a clear view of Mr. Darwin's chain of reasoning, and of our objections to it, if we set before them, first, the conclusion to which he seeks to bring them; next, the leading propositions which he must establish in order to make good his final inference; and then the mode by which he endeavours to support his propositions.

The conclusion, then, to which Mr. Darwin would bring us is, that all the various forms of vegetable and animal life with which the globe is now peopled, or of which we find the remains preserved in a fossil state in the great Earth-Museum around us, which the science of geology unlocks for our instruction, have come down by natural succession of descent from father to son,—'animals from at most four or five progenitors, and plants from an equal or less number' (p. 484), as Mr. Darwin at first somewhat diffidently suggests; or rather, as, growing bolder when he has once pronounced his theory, he goes on to suggest to us, from one single head:—

'Analogy would lead me one step further, namely, to the belief that ALL ANIMALS and PLANTS have descended from some one prototype. But analogy may be a deceitful guide. Nevertheless, all living things have much in common in their chemical composition, their germinal vesicles, their cellular structure, and their laws of growth and reproduction. . . . Therefore I should infer from analogy that probably all the organic beings which have ever lived on this earth' (man therefore of course included) 'have descended from some one primordial form into which life was first breathed by the Creator.'—p. 484.

This is the theory which really pervades the whole volume. Man, beast, creeping

thing, and plant of the earth, are all the lineal and direct descendants of some one individual *ens*, whose various progeny have been simply modified by the action of natural and ascertainable conditions into the multiform aspect of life which we see around us. This is undoubtedly at first sight a somewhat startling conclusion to arrive at. To find that mosses, grasses, turnips, oaks, worms, and flies, mites and elephants, infusoria and whales, tadpoles of to-day and venerable saurians, truffles and men, are all equally the lineal descendants of the same aboriginal common ancestor, perhaps of the nucleated cell of some primæval fungus, which alone possessed the distinguishing honour of being the 'one primordial form into which life was first breathed by the Creator'—this, to say the least of it, is no common discovery—no very expected conclusion. But we are too loyal pupils of inductive philosophy to start back from any conclusion by reason of its strangeness. Newton's patient philosophy taught him to find in the falling apple the law which governs the silent movements of the stars in their courses; and if Mr. Darwin can with the same correctness of reasoning demonstrate to us our fungular descent, we shall dismiss our pride, and avow, with the characteristic humility of philosophy, our unsuspected cousinship with the mushrooms,—

'Claim kindred there, and have our claim allowed.'

—only we shall ask leave to scrutinise carefully every step of the argument which has such an ending, and demur if at any point of it we are invited to substitute unlimited hypothesis for patient observation, or the spasmodic fluttering flight of fancy for the severe conclusions to which logical accuracy of reasoning has led the way.

Now, the main propositions by which Mr. Darwin's conclusion is attained are these:—

1. That observed and admitted variations spring up in the course of descents from a common progenitor.

2. That many of these variations tend to an improvement upon the parent stock.

3. That, by a continued selection of these improved specimens as the progenitors of future stock, its improvements may be unlimitedly increased.

4. And, lastly, that there is in nature a power continually and universally working out this selection, and so fixing and augmenting these improvements.

Mr. Darwin's whole theory rests upon the truth of these propositions, and crumbles utterly away if only one of them fail him. These therefore we must closely scrutinise. We will begin with the last in our series, both

because we think it the newest and the most ingenious part of Mr. Darwin's whole argument, and also because, whilst we absolutely deny the mode in which he seeks to apply the existence of the power to help him in his argument, yet we think that he throws great and very interesting light upon the fact that such a self-acting power does actively and continuously work in all creation around us.

Mr. Darwin finds then the disseminating and improving power, which he needs to account for the development of new forms in nature, in the principle of 'Natural Selection,' which is evolved in the strife for room to live and flourish which is evermore maintained between themselves by all living things. One of the most interesting parts of Mr. Darwin's volume is that in which he establishes this law of natural selection; we say establishes, because—repeating that we differ from him totally in the limits which he would assign for its action—we have no doubt of the existence or of the importance of the law itself. Mr. Darwin illustrates it thus:—

'There is no exception to the rule that every organic being naturally increases at so high a rate, that, if not destroyed, the earth would soon be covered by the offspring of a single pair. Linnæus has calculated that if an animal plant produced only two seeds—and there is no plant so unproductive as this—and their seedlings next year produced two, and so on, then in twenty years there would be a million plants. The elephant is reckoned the slowest breeder of all known animals, and I have taken some pains to estimate its probable minimum rate of natural increase. It will be under the mark to assume that it breeds when thirty years old, and goes on breeding till ninety years old, bringing forth three pair of young in this interval; if this be so, at the end of the fifth century there would be alive fifteen million elephants, descended from the first pair.'—p. 64.

Leaving theoretical calculations, Mr. Darwin proceeds to facts to establish this rapid increase:—

'Several of the plants, such as the cardoon, and a tall thistle, now most numerous over the wide plains of La Plata, clothing square leagues of surface almost to the exclusion of all other plants, have been introduced from Europe.'—p. 65.

And, again, he reasons from the animal world:—

'The condor lays a couple of eggs and the ostrich a score, and yet in the same country the condor may be the more numerous of the two. The fulmar petrel lays but one egg, yet it is believed to be the most numerous bird in the world.'—p. 66.

This is followed by a passage which well illustrates the care and cleverness of Mr. Darwin's own observations:—

'On a piece of ground three feet long and two wide, dug and cleaned, and where there could be no choking from other plants, I marked all the seedlings of our native weeds as they came up, and, out of the 357, no less than 295 were destroyed, chiefly by slugs and insects. If turf which has long been mown—and the case would be the same with turf closely browsed by quadrupeds—be let to grow, the more vigorous plants gradually kill the less vigorous though fully grown plants; thus out of twenty species growing on a little plot of turf (three feet by four), nine species perished from the other species being allowed to grow up freely.'—pp. 67, 68.

Now all this is excellent. The facts are all gathered from a true observation of nature and from a patiently obtained comprehension of their undoubted and unquestionable relative significance. That such a struggle for life then actually exists, and that it tends continually to lead the strong to exterminate the weak, we readily admit; and in this law we see a merciful provision against the deterioration, in a world apt to deteriorate, of the works of the Creator's hands. Thus it is that the bloody strifes of the males of all wild animals tend to maintain the vigour and full development of their race; because, through this machinery of appetite and passion, the most vigorous individuals become the progenitors of the next generation of the tribe. And this law, which thus maintains through the struggle of individuals the high type of the family, tends continually, through a similar struggle of species, to lead the stronger species to supplant the weaker.

This indeed is no new observation: Lucretius knew and eloquently expatiated on its truth:—

'Multaque tum interiisse animantum secla ne-  
cesse est,  
Nec potuisse propagando procedere prolem.  
Nam, quæcumque vides vesci vitalibus auris  
Aut dolus, aut virtus, aut denique mobilitas, est,  
Ex inenante ævo, genus id tutata reservans.'\*

And this, which is true in animal, is no less true in vegetable life. Hardier or more prolific plants, or plants better suited to the soil or conditions of climate, continually tend to supplant others less hardy, less prolific, or less suited to the conditions of vegetable life in those special districts. Thus far, then, the action of such a law as this is clear and indisputable.

But before we can go a step further, and argue from its operation in favour of a perpetual improvement in natural types, we must be shown first that this law of compe-

tion has in nature to deal with such favourable variations in the individuals of any species, as truly to exalt those individuals above the highest type of perfection to which their least imperfect predecessors attained—above, that is to say, the normal level of the species;—that such individual improvement is, in truth, a rising above the highest level of any former tide, and not merely the return in its appointed season of the feebler neap to the fuller spring-tide;—and then, next, we must be shown that there is actively at work in nature, co-ordinate with the law of competition and with the existence of such favourable variations, a power of accumulating such favourable variation through successive descents. Failing the establishment of either of these last two propositions, Mr. Darwin's whole theory falls to pieces. He has accordingly laboured with all his strength to establish these, and into that attempt we must now follow him.

Mr. Darwin begins by endeavouring to prove that such variations are produced under the selecting power of man amongst domestic animals. Now here we demur *in limine*. Mr. Darwin himself allows that there is a plastic habit amongst domesticated animals which is not found amongst them when in a state of nature. 'Under domestication, it may be truly said that the whole organization becomes in some degree plastic.'—(p. 80.) If so, it is not fair to argue, from the variations of the plastic nature, as to what he himself admits is the far more rigid nature of the undomesticated animal. But we are ready to give Mr. Darwin this point, and to join issue with him on the variations which he is able to adduce, as having been produced under circumstances the most favourable to change. He takes for this purpose the domestic pigeon, the most favourable specimen no doubt, for many reasons, which he could select, as being a race eminently subject to variation, the variations of which have been most carefully observed by breeders, and which, having been for some 4,000 years domesticated, affords the longest possible period for the accumulation of variations. But with all this in his favour, what is he able to show? He writes a delightful chapter upon pigeons. Runts and fantails, short-faced tumblers and long-faced tumblers, long-beaked carriers and pouters, black bars, jacobins, and turbits, coo and tumble, inflate their œsophagi, and pout and spread out their tails before us. We learn that 'pigeons have been watched and tended with the utmost care, and loved by many people.' They have been domesticated for thousands of years in several quarters of the world. The earliest known record of pigeons is in the fifth Egyptian dy-

\* Lucret., 'De Rer. Nat.' lib. v.

nasty, about 3,000 B.C., though 'pigeons are given in a bill of fare' (what an autograph would be that of the chef-de-cuisine of the day!) 'in the previous dynasty' (pp. 27, 28): and so we follow pigeons on down to the days of 'that most skilful breeder Sir John Sebright,' who 'used to say, with respect to pigeons, that "he would produce any given feather in three years, but it would take him six years to produce beak and head."'— (p. 31.)

Now all this is very pleasant writing, especially for pigeon-fanciers; but what step do we really gain in it at all towards establishing the alleged fact that variations are but species in the act of formation, or in establishing Mr. Darwin's position that a well-marked variety may be called an incipient species? We affirm positively that no single *fact* tending even in that direction is brought forward. On the contrary, every one points distinctly towards the opposite conclusion; for with all the change wrought in appearance, with all the apparent variation in manners, there is not the faintest beginning of any such change in what that great comparative anatomist, Professor Owen, calls 'the characteristics of the skeleton or other parts of the frame upon which specific differences are founded.\*' There is no tendency to that great law of sterility which, in spite of Mr. Darwin, we affirm ever to mark the hybrid; for every variety of pigeon, and the descendants of every such mixture, breed as freely, and with as great fertility, as the original pair; nor is there the very first appearance of that power of accumulating variations until they grow into specific differences, which is essential to the argument for the transmutation of species; for, as Mr. Darwin allows, sudden returns in colour, and other most altered appearances, to the parent stock, continually attest the tendency of variations not to become fixed, but to vanish, and manifest the perpetual presence of a principle which leads not to the accumulation of minute variations into well-marked species, but to a return from the abnormal to the original type. So clear is this, that it is well known that any relaxation in the breeder's care effaces all the established points of difference, and the fancy-pigeon reverts again to the character of its simplest ancestor.

The same relapse may moreover be traced in still wider instances. There are many testimonies to the fact that domesticated animals, removed from the care and tending of man, lose rapidly the peculiar variations which domestication had introduced amongst them, and relapse into their old untamed con-

dition. 'Plus,' says M. P. S. Pallas,\* 'je réfléchis, plus je suis disposé à croire que la race des chevaux sauvages que l'on trouve dans les landes baignées par le Jaik et le Don, et dans celles de Baraba, ne provient que de chevaux Kirguis et Kalmouks devenus sauvages,' &c.; and he proceeds to show how far they have relapsed from the type of tame into that of wild horses. Prichard, in his 'Natural History of Man,' remarks that the present state of the escaped domesticated animals, which, since the discovery of the Western Continent by the Spaniards, have been transported from Europe to America, gives us an opportunity of seeing how soon the relapse may become almost complete. 'Many of these races have multiplied (he says) 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 most obvious appearances of domestication.†' This he proceeds to prove to be more or less the case as to the hog, the horse, the ass, the sheep, the goat, the cow, the dog, the cat, and gallinaceous fowls.

Now, in all these instances we have the result of the power of selection exercised on the most favourable species for a very long period of time, in a race of that peculiarly plastic habit which is the result of long domestication; and that result is, to prove that there has been no commencement of any such mutation as could, if it was infinitely prolonged, become really a specific change.

There is another race of animals which comes under our closest inspection, which has been the friend and companion of man certainly ever since the wandering Ulysses returned to Ithaca, and of which it has been man's interest to obtain every variation which he could extract out of the original stock. The result is every day before us. We all know the vast difference, which strikes the dullest eye, between, for instance, the short bandy-legged snub-nosed bull-dog, and the almost aerial Italian gray-hound. Here again the experiment of variation by selection has been well-nigh tried out. And with what results? Here again with an absolute absence of the first dawns of any variety which could by its own unlimited prolongation constitute a specific difference. Again there is perfect freedom and fertility of interbreeding; again a continual tendency to revert to the common type; again, even in the most apparently dissimilar specimens, a really specific agreement. Hear what Professor Owen says on this point:—

\* 'Voyages de M. P. S. Pallas, traduit de l'Allemand par M. Gaultier de la Peyronne,' vol. i. p. 89.

† 'Natural History of Man,' pp. 27, 28.

\* 'On the Classification of Mammalia,' p. 98.

'No species of animal has been subject to such deoifive experiments, continued through so many generations, as to the influence of different degrees of exercise of the muscular system, difference in regard to food, association with man, and the concomitant stimulus to the development of intelligence, as the dog; and no domestic animal manifests so great a range of variety in regard to general size, to colour and character of hair, and to the form of the head, as it is affected by different proportions of the cranium and face, and by inter-muscular crests superadded to the cranial parietes. Yet, under the extremest mark of variety so superinduced, the naturalist detects in the dental formula and in the construction of the cranium the unmistakable generic and specific characters of the *Canis familiaris*.\*

Note also how unerringly and plainly the extremest varieties of the dog-kind recognise their own specific relationship. How differently does the giant Newfoundland behave to the dwarf pug on a casual rencontre, from the way in which either of them would treat a jackal, a wolf, or a fox. The dumb animal might teach the philosopher that unity of kind or of species is discoverable under the strangest mask of variation.

Nor let our readers forget over how large a lapse of time our opportunities of observation extend. From the early Egyptian habit of embalming, we know that for 4000 years at least the species of our own domestic animals, the cat, the dog, and others, has remained absolutely unaltered.

Yet it is in the face of such facts as these that Mr. Darwin ventures, first, to declare that "new races of animals and plants are produced under domestication by man's methodical and unconscious power of selection, for his own use and pleasure," and then to draw from the changes introduced amongst domesticated animals this caution for naturalists: 'May they not learn a lesson of caution when they deride the idea of species in a state of nature being lineal descendants of other species?' (p. 29.)

Nor must we pass over unnoticed the transference of the argument from the domesticated to the untamed animals. Assuming that man as the selector can do much in a limited time, Mr. Darwin argues that Nature, a more powerful, a more continuous power, working over vastly extended ranges of time, can do more. But why should Nature, so uniform and persistent in all her operations, tend in this instance to change? why should she become a selector of varieties? Because, most ingeniously argues Mr. Darwin, in the struggle for life, if any variety favourable to the individual were developed, that individual would have a better chance in the battle of life, would assert more

proudly his own place, and, handing on his peculiarity to his descendants, would become the progenitor of an improved race; and so a variety would have grown into a species.

We think it difficult to find a theory fuller of assumptions; and of assumptions not grounded upon alleged facts in nature, but which are absolutely opposed to all the facts we have been able to observe.

1. We have already shown that the variations of which we have proof under domestication have never, under the longest and most continued system of selections we have known, laid the first foundation of a specific difference, but have always tended to relapse, and not to accumulated and fixed persistence.

But, 2ndly, all these variations have the essential characteristics of *monstrosity* about them; and *not one* of them has the character which Mr. Darwin repeatedly reminds us is the *only one* which nature can select, viz of being an advantage to the selected individual in the battle of life, i. e. an improvement upon the normal type by raising some individual of the species not to the highest possible excellence within the species, but to some excellence above it. So far from this, every variation introduced by man is for man's advantage, not for the advantage of the animal. Correlation is so certainly the law of all animal existence that man can only develop one part by the sacrifice of another. The bulldog gains in strength and loses in swiftness; the grayhound gains in swiftness but loses in strength. Even the English race-horse loses much which would enable it in the battle of life to compete with its rougher ancestor. So too with our prize-cattle. Their greater tendency to an earlier accumulation of meat and fat is counterbalanced, as is well known, by loss of robust health, fertility, and of power of yielding milk, in proportion to their special development in the direction which man's use of them as food requires. There is not a shadow of ground for saying that man's variations ever improve the typical character of the animal as an animal; they do but by some monstrous development make it more useful to himself; and hence it is that Nature, according to her universal law with monstrosities, is ever tending to obliterate the deviation and to return to the type.

The applied argument, then, from variation under domestication, fails utterly. But further, what does observation say as to the occurrence of a single instance of such favourable variation? Men have now for thousands of years been conversant as hunters and other rough naturalists with animals of every class. Has any one such instance ever been discovered? We fearlessly assert not one. Variations have been found: rodents whose teeth

\* Owen's 'Classification of Mammalia,' p. 100.

have grown abnormally; animals of various classes of which the eyes, from the absence of light in their dwellings, have been obscured and obliterated; but *not* one which has tended to raise the individual in the struggle of life above the typical conditions of its own species. Mr. Darwin himself allows that he finds none; and accounts for their absence in existing fauna only by the suggestion, that, in the competition between the less improved parent-form and the improved successor, the parent will have yielded in the strife in order to make room for the successor; and so 'both the parent and all the transitional varieties will generally have been exterminated by the very process of formation and perfection of the new form' (p. 172),—a most unsatisfactory answer as it seems to us; for why—since if this is Nature's law these innumerable changes must be daily occurring—should there never be any one produceable proof of their existence?

Here then again, when subjected to the stern Baconian law of the observation of facts, the theory breaks down utterly; for no natural variations from the specific type favourable to the individual from which nature is to select can anywhere be found.

But once more. If these transmutations were actually occurring, must there not, in some part of the great economy of nature round us, be somewhere at least some instance to be quoted of the accomplishment of the change? With many of the lower forms of animals, life is so short and generations so rapid in their succession that it would be all but impossible, if such changes were happening, that there should be no proof of their occurrence; yet never have the longing observations of Mr. Darwin and the transmutationists found one such instance to establish their theory, and this although the shades between one class and another are often most lightly marked. For there are creatures which occupy a doubtful post between the animal and the vegetable kingdoms—half-notes in the great scale of nature's harmony. Is it credible that all favourable varieties of turnips are tending to become men, and yet that the closest microscopic observation has never detected the faintest tendency in the highest of the *Algæ* to improve into the very lowest *Zoophyte*?

Again, we have not only the existing tribes of animals out of which we cull, if it were possible, the instances which the transmutationists require to make their theory defensible consistently with the simplest laws of inductive science, but we have in the earth beneath us a vast museum of the forms which have preceded us. Over so vast a period of time does Mr. Darwin extend this collection

that he finds reasons for believing that 'it is not improbable that a longer period than 300,000,000 years has elapsed since the latter part of the secondary (geological) period' alone. (p. 287.) Here then surely at last we must find the missing links of that vast chain of innumerable and separately imperceptible variations, which has convinced the inquirer into Nature's undoubted facts of the truth of the transmutation theory. But no such thing. The links are wholly wanting, and the multiplicity of these facts and their absolute rebellion against Mr. Darwin's theory is perhaps his chief difficulty. Here is his own statement of it, and his mode of meeting it:—

'Why then is not every geological formation and every stratum full of such intermediate links? Geology assuredly does not reveal any such finely graduated organic chain; and this, perhaps, is the most obvious and gravest objection which can be urged against my theory. The explanation lies, as I believe, in the extreme imperfection of the geological record.'—p. 280.

This 'Imperfection of the Geological Record,' and the 'Geological Succession,' are the subjects of two laboured and ingenious chapters, in which he tries, as we think utterly in vain, to break down the unanswerable refutation which is given to his theory by the testimony of the rocks. He treats the subject thus:—1. He affirms that only a small portion of the globe has been explored with care. 2. He extends at will to new and hitherto unsuspected myriads of years the times which have elapsed between successive formations in order to account for the utter absence of everything like a succession of ascertainable variations in the successive inhabitants of the earth. How he deals in these suggestions with time, filling in or striking out a few millions of years at pleasure, the following comprehensive sentence may show:

'At this rate, on the above data, the denudation of the Weald must have required 806,662,400 years, or say three hundred million years. But perhaps it would be safer to allow two or three inches per century, and this would reduce the number of years to 150 or 100 million years.'—p. 287.

As these calculations concerning the general duration of formations, and specially concerning the Weald, are highly characteristic of the whole 'argument,' it may be worth while to submit them to a somewhat closer examination.

Mr. Darwin then argues (pp. 285, 286) that 'faults' proclaim the vastness of these durations. To establish this, he supposes that the result of a great fracture was the severing of strata once continuous, so as to throw them relatively a thousand feet apart



from their original position, and thus form a cliff which stood up vertically on one side of that dislocation; and so he imagines that countless ages must have elapsed, *according to the present waste of land*, to account for the wearing down of these outlines, so as to have left (as is often the case) no trace of the great dislocation upon the present surface of the land. But, with hardly an exception, every sound geologist would repudiate as a 'petitio principii' this whole method of reasoning; for though a few geologists would explain these great dislocations on the hypothesis of intermittent successive movements severally of small amount, yet in the judgment of far the larger number, and the more judicious of those who have made geology their study, they were undoubtedly the result of sudden movements, produced by internal efforts of central heat and gas to escape, and were infinitely more intense and spasmodic (catastrophic if you will) than any of those similar causes which, in a minor way, now produce our earthquakes and oscillations of the surface to the extent of a few feet only. Hence these great breaks and fractures were of such a nature as to render it impossible that any cliff should, at the period of their formation, have stood up on one side of the fracture. The very violence of the movement, accompanied as it must have been by the translation of vast masses of water sweeping away the rubbish, may, on the instant, have almost entirely smoothed down the ruptured fragments; the more so, as most of these great dislocations are believed to have taken place *under the sea*. The flattening down of all superficial appearances was therefore most probably the direct result of the catastrophe, and the countless ages of Darwin were, in all probability, at the longest, nothing more than a few months or years of our time.

The whole argument as to the Wealden denudation (p. 287) appears to us a similar exaggeration. Granting that rocky coasts are very slowly worn away by the present sea, the application of this view to the north and south coasts of the valley of the Weald, *i. e.* to the escarpments of the North and South Downs, is entirely untenable. For what shadow of proof is there that these chalk escarpments have been worn down inch by inch by the erosion of the waves of a former sea? It may be said to have been demonstrated\* by that great practical observer and philosophical geologist Sir R. Murchison, that, inasmuch as there is no trace of rounded water-worn pebbles nor shingles in any portion of the Weald (though there were plenty on

the slopes without), the sea never could have so acted along these escarpments as on a shore, and hence the whole of the basis of the reasoning, about the three hundred million of years for the denudation of the cretaceous and subjacent deposits, is itself washed away at once.

But not only do the facts to which Mr. Darwin trusts to establish his vast lapse of years, which, he says, 'impress his mind almost in the same manner as does the vain endeavour to grapple with the idea of Eternity' (p. 285), not only do these give him the same power of supposing the progress of changes, of which we have found neither the commencement, nor the progress, nor the record, as ancient geographers allowed themselves, when they speculated upon the forms of men whose heads grew beneath their shoulders in the unreached recesses of Africa,—but when, passing from these unlimited terms for change to work in, he proceeds to deal with the absence of all record of the changes themselves, the plainest geological facts again disprove his assumptions. For here he assumes that there are everywhere vast gaps (p. 302) between successive formations, which might, if they were filled up, furnish instances of all the many gradations required by his theory, and also that the past condition of the earth made the preservation of such specimens improbable. To prove the existence of these wide gaps, Mr. Darwin quotes (p. 289) Sir R. Murchison's great work on 'Russia;' but he appears to us to quote it incorrectly, for we understand it to say that there is abundant evidence that in that drift-covered region there are many evidences of the transition from the Devonian into the Carboniferous era in Palæozoic life, and also from the old Aralo-Caspian, or brackish water condition of tertiary times into present oceanic life; and that if all the rocks of Russia could be uncovered and the drift removed, we might discover many more of these transitions. In fact, although the geological record is often broken, we already know of many unbroken and perfect transitions between the Cambrian and Silurian, between the Silurian and Devonian, between the Devonian and Carboniferous, if not between the latter and the Permian.

Again, there is an absolute unbroken physical connection in Germany between the Permian and the Trias, and yet an entire separation of animals, and so on in Secondary and Tertiary deposits.

Now, if the field-geologist can show clear proofs of continuous deposit, and yet many distinct plants and animals in the succeeding formations, what becomes of that immense lapse of ages which should transform the

\* See 'Quarterly Journal of the Geological Society,' London.

Palæozoic Permian type into the entirely distinct Secondary or Triassic form? All such links are absolutely wanting even in these tracts, and in many others, where the conformable and gradual transition between formations proves that there is between them no break, and where everything indicates quiet physical transition, and which yet contain utterly different remains. How then can we account for such distinct forms of life in the quietly succeeding formations except by distinct creations?

Mr. Darwin is compelled to admit that he finds no records in the crust of the earth to verify his assumption:—

'To the question why we do not find records of these vast primordial periods, I can give no satisfactory answer.'—p. 808.

And again—

'The difficulty of understanding the absence of vast piles of fossiliferous strata, which on my theory no doubt were somewhere accumulated before the Silurian epoch, is very great.'—p. 308.

As to the suggestion that the absence of organic remains is no proof of the non-existence of the unrepresented classes, we would rather speak in the weighty words of Professor Owen than employ our own:—

'The sum of the evidence which has been obtained appears to prove that the successive extinction of Amphitheria, Spalacotheria, Triconodons, and other mesozoic forms of mammals, has been followed by the introduction of much more numerous, varied, and higher organized forms of the class, during the tertiary periods. There are, however, geologists who maintain that this is an assumption based upon a partial knowledge of the facts.

'In the palæozoic strata, which, from their extent and depth, indicate, in the earth's existence as a seat of organic life, a period as prolonged as that which has followed their deposition, no trace of mammals has been observed. It may be conceded that, were mammals peculiar to dry land, such negative evidence would weigh little in producing conviction of their non-existence during the Silurian and Devonian æons, because the explored parts of such strata have been deposited from an ocean, and the chance of finding a terrestrial and air-breathing creature's remains in oceanic deposits is very remote. But in the present state of the warm-blooded, air-breathing, viviparous class, no genera and species are represented by such numerous and widely-dispersed individuals as those of the order Cetaceæ, which under the guise of fishes, dwell, and can only live, in the ocean.

'In all cetacea the skeleton is well ossified, and the vertebræ are very numerous; the smallest cetaceans would be deemed large amongst land-mammals, the largest surpass in bulk any creatures of which we have yet gained cognizance. The hugest ichthyosaur, iguanodon,

megalosaur, mammoth, or megathere, is a dwarf in comparison with the modern whale of a hundred feet in length.

'During the period in which we have proof that cetacea have existed, the evidence in the shape of bones and teeth, which latter enduring characteristics in most of the species are peculiar for their great number in the same individual, must have been abundantly deposited at the bottom of the sea; and as cachalots, grampuses, dolphins, and porpoises, are seen gambolling in shoals in deep oceans, far from land, their remains will form the most characteristic evidences of vertebrate life in the strata now in course of formation at the bottom of such oceans. Accordingly, it consists with the known characteristics of the cetacean class to find the marine deposits which fell from seas tenanted, as now, with vertebrates of that high grade, containing the fossil evidences of the order in vast abundance.'\*

And on that subject he again maintains:—

'In like manner does such negative evidence weigh with me in proof of the non-existence of marine mammals in the liassic and oolitic times. In the marine deposits of those secondary or mesozoic epochs, the evidence of vertebrates governing the ocean, and preying on inferior marine vertebrates, is as abundant as that of air-breathing vertebrates in the tertiary strata; but in the one the fossils are exclusively of the cold-blooded reptilian class, in the other of the warm-blooded mammalian class. The Enaliosauria, Cetiosauria, and Crocodilia played the same part and fulfilled similar offices in the seas from which the lias and oolites were precipitated, as the Delphinidæ and Balænidæ did in the tertiary and still do in the present seas. The unbiassed conclusion from both negative and positive evidence in this matter is, that the Cetacea succeeded and superseded the Enaliosauria. To the mind that will not accept such conclusion, the stratified oolitic rocks must cease to be monuments or trustworthy records of the condition of life on the earth at that period.'—p. 59.

And he thus sums up the argument:—

'So far, however, as any general conclusion can be deduced from the large sum of evidence above referred to and contrasted, it is against the doctrine of the Uniformitarian. Organic remains traced from their earliest known graves are succeeded one series by another, to the present period, and never reappear when once lost sight of in the ascending search. As well might we expect a living ichthyosaur in the Pacific as a fossil whale in the lias: the rule governs as strongly in the retrospect as the prospect. And not only as respects the vertebrata, but the sum of the animal species at each successive geological period has been distinct and peculiar to such period.'—p. 60.

Mr. Darwin's own pages bear witness to the same conclusion. The rare land shell

\* Owen 'On the Classification of Mammalia,' pp. 58, 59.

found by Sir C. Lyell and Dr. Dawson in North America affords a conclusive proof that in the carboniferous period such animals were most rare, and only the earliest of that sort created. For the carboniferous strata of North America, stretching over tracts as large as the British Isles, and containing innumerable plants and other terrestrial things, must have been very equally depressed and elevated, since the very flowers and fruits of the plants of the period have been preserved; and if terrestrial animals abounded, why do we not see more of their remains than this miserable little dendro-pupa about a quarter of an inch long?

It would be wearisome to prolong these proofs; but if to any man they seem insufficient, let him read carefully the conclusion of Sir Roderick Murchison's masterly work upon 'Siluria.' We venture to aver that the conviction must be forced upon him that the geological record is absolutely inconsistent with the truth of Mr. Darwin's theory; and yet by Mr. Darwin's own confession this conclusion is fatal to his whole argument:

'If my theory be true, it is indisputable that, before the lowest Silurian stratum was deposited, long periods elapsed, as long as, or probably far longer than, the whole interval from the Silurian age to the present day; and that during these vast yet quite unknown periods of time, the world swarmed with living creatures.'—p. 307.

Now it is proved to demonstration by Sir Roderick Murchison, and admitted by all geologists, that we possess these earlier formations, stretching over vast extents, perfectly unaltered, and exhibiting no signs of life. Here we have, as nearly as it is possible in the nature of things to have, the absolute proof of a negative. If these forms of life had existed they must have been found. Even Mr. Darwin shrinks from the deadly gripe of this argument. 'The case,' he says (p. 308) 'at present must remain inexplicable, and may be truly urged as a valid argument against the views here entertained.' More than once indeed does he make this admission. One passage we have quoted already from p. 280 of his work. With equal candour he says further on:—

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

And, once more—

'Why does not every collection of fossil remains afford plain evidence of the gradation and mutation of the forms of life? We meet with no such evidence, and this is the most obvious and forcible of the many objections which may be urged against my theory.'—p. 463.

But though this objection is that which is rated highest by himself, there is another which appears to us in some respects stronger still, and to which we deem Mr. Darwin's answers equally insufficient,—we mean the law of sterility affixed to hybridism. If it were possible to proclaim more distinctly by one provision than another that the difference between various species was a law of creation, and not, as the transmutationists maintain, an ever-varying accident, it would surely be by the interposing such a bar to change as that which now exists in the universal fruitlessness which is the result of all known mixtures of animals specifically distinct. Mr. Darwin labours hard here, but his utmost success is to reveal a very few instances from the vegetable world, with its shadowy image of the procreative animal system, as exceptions to the universal rule. As to animals, he is compelled by the plainness of the testimony against him to admit that he 'doubts whether any case of a perfect fertile hybrid animal can be considered as thoroughly well authenticated' (p. 252); and his best attempts to get rid of this evidence are such suggestions as that 'the common and the true ring-necked pheasant intercross' (p. 253), though every breeder of game could tell him that, so far from there being the slightest ground for considering these as distinct species, all experience shows that the ring-neck almost uniformly appears where the common pheasant's eggs are hatched under the domestic hen. How then does Mr. Darwin dispose of this apparently impassable barrier of nature against the transmutation-theory? He urges that it depends not upon any great law of life, but mainly, first, on the early death of the embryo, or, secondly, upon 'the common imperfection of the reproductive system' in the male offspring. How he considers this to be any answer to the difficulty it is beyond our power to conceive. We can hardly imagine any clearer way of stating the mode in which an universal law, if existed, must act, than that in which he describes it, to disprove its existence. But, besides this, other and insuperable difficulties beset this whole speculation. To one of these Mr. Darwin alludes (pp. 192, 193), and dismisses it with a most suspicious brevity. 'The electric organs of fishes,' he says, 'offer another case of special difficulty,' and he places as 'a parallel case of difficulty the presence of luminous organs in a few

insects belonging to different families and orders.

We see no possible solution on the Darwinian theory for the presence at once so marked and so exceptional of these organs. And how are they dealt with? Surely in a mode most unsatisfactory by one promulgating a new theory of creation; for scarcely admitting that their presence is little else than destructive of his theory, Mr. Darwin simply remarks 'that we are too ignorant to argue that no transition of any kind is possible,' a solution which could of course equally make the scheme it is intended to serve compatible with any other contradiction.

It is the more important to notice this, because there is another large class of cases in which the same difficulty is present, and as to which Mr. Darwin suggests no solution. We allude to those animals which, like many snakes, possess special organs for secreting venom and for discharging it at their own proper volition. The whole set of glands, ducts, and other vessels employed for this purpose are, as any instructed comparative anatomist would tell him, so entirely separate from the ordinary laws of animal life and peculiar to themselves, that the derivation of these by any natural modification from progenitors which did not possess them would be a marvellous contradiction of all laws of descent with which we are familiar. And this special and unnoticed difficulty leads us on to another of still wider extent. Most of our readers know that the stomachs and whole digestive system of the carnivori are constructed upon a wholly different type from those of the graminivorous animals. Yet whence this difference, if these diverse constructions can claim a common origin? Can any permutationist pretend that experience gives us any reason for believing that any change of food, however unnatural or forced, ever has changed or ever could change the one type into the other? Yet that diversity pervades the whole being of the separated classes. It does not affect only their outward forms, as to which the merest accidents of colour or of hair may veil real resemblance under seeming difference, but it pervades the nervous system, the organs of reproduction, the stomach, the alimentary canal; nay, in every blood-corpuscle which circulates through their arteries and veins it is universally present and perpetually active.

Where, then, in the most allied forms, was the earliest commencement of diversity? or what advantage of life could alter the shape of the corpuscles into which the blood can be evaporated?

We come then to these conclusions. All the facts presented to us in the natural world tend to show that none of the variations pro-

duced in the fixed forms of animal life, when seen in its most plastic condition under domestication, give any promise of a true transmutation of species; first, from the difficulty of accumulating and fixing variations within the same species; secondly, from the fact that these variations, though most serviceable for man, have no tendency to improve the individual beyond the standard of his own specific type, and so to afford matter, even if they were infinitely produced, for the supposed power of natural selection on which to work; whilst all variations from the mixture of species are barred by the inexorable law of hybrid sterility. Further, the embalmed records of 3000 years show that there has been no beginning of transmutation in the species of our most familiar domesticated animals; and beyond this, that in the countless tribes of animal life around us, down to its lowest and most variable species, no one has ever discovered a single instance of such transmutation being now in prospect; no new organ has ever been known to be developed—no new natural instinct to be formed—whilst, finally, in the vast museum of departed animal life which the strata of the earth imbed for our examination, whilst they contain far too complete a representation of the past to be set aside as a mere imperfect record, yet afford no one instance of any such change as having ever been in progress, or give us anywhere the missing links of the assumed chain, or the remains which would enable now existing variations; by gradual approximations, to shade off into unity.

On what then is the new theory based? We say it with unfeigned regret, in dealing with such a man as Mr. Darwin, on the merest hypothesis, supported by the most unbounded assumptions. These are strong words, but we will give a few instances to prove their truth:—

'All physiologists admit that the swim-bladder is homologous or "ideally similar" in position and structure with the lungs of the higher vertebrate animals; hence there *seems to me to be no great difficulty in believing that natural selection has actually converted a swim-bladder into a lung, or organ used exclusively for respiration.*'—p. 191.

'*I can indeed hardly doubt that all vertebrate animals having true lungs have descended by ordinary generation from the ancient prototype, of which we know nothing, furnished with a floating apparatus or swim-bladder.*'—p. 191.]

We must be cautious

'In concluding that the most different habits of all *could not* graduate into each other; that a bat, for instance, *could not* have been formed by

natural selection from an animal which at first could only glide through the air.'—p. 204.

Again :—

'I see no difficulty in supposing that such links formerly existed, and that each had been formed by the same steps as in the case of the less perfectly gliding squirrels, and that each grade of structure was useful to its possessor. Nor can I see any insuperable difficulty in further believing it possible that the membrane-connected fingers and forearm of the galeopithecus might be greatly lengthened by natural selection, and this, as far as the organs of flight are concerned, would convert it into a bat.'—p. 181.

'For instance, a swim-bladder has apparently been converted into an air-breathing lung.'—p. 204.

And again :—

'The electric organs of fishes offer another case of special difficulty. It is impossible to conceive by what steps these wondrous organs have been produced; but, as Owen and others have remarked, their intimate structure closely resembles that of common muscle; and as it has lately been shown that rays have an organ closely analogous to the electric apparatus, and yet do not, as Matteucci asserts, discharge any electricity, we must own that we are far too ignorant to argue that no transition of any kind is possible.'—pp. 192-3.

Sometimes Mr. Darwin seems for a moment to recoil himself from this extravagant liberty of speculation, as when he says, concerning the eye,—

'To suppose that the eye, with its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, could have been formed by natural selection, seems, I freely confess, absurd in the highest possible degree.'—p. 186.

But he soon returns to his new wantonness of conjecture, and, without the shadow of a fact, contents himself with saying that—

'he suspects that any sensitive nerve may be rendered sensitive to light, and likewise to those coarser vibrations of the air which produce sound.'—p. 187.

And in the following passage he carries this extravagance to the highest pitch, requiring a licence for advancing as true any theory which cannot be demonstrated to be actually impossible :—

'If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down. But I can find no such case.'—p. 189.

Another of these assumptions is not a little remarkable. It suits the argument to deduce all our known varieties of pigeon from the rock-pigeon (the *Columba livia*), and this parentage is traced out, though not, we think, to demonstration, yet with great ingenuity and patience. But another branch of the argument would be greatly strengthened by establishing the descent of our various breeds of dogs with their perfect power of fertile inter-breeding from different natural species. And accordingly, though every fact as to the canine race is parallel to the facts which have been used before to establish the common parentage of the pigeons in *Columba livia*, all these are thrown over in a moment, and Mr. Darwin, first assuming, without the shadow of proof, that our domestic breeds are descended from different species, proceeds calmly to argue from this, as though it were a demonstrated certainty.

'It seems to me unlikely in the case of the dog-genus, which is distributed in a wild state throughout the world, that since man first appeared one species alone should have been domesticated.'—p. 18.

'In some cases I do not doubt that the intercrossing of species aboriginally distinct has played an important part in the origin of our domestic productions.'—p. 43.

What new words are these for a loyal disciple of the true Baconian philosophy!—'I can conceive'—'It is not incredible'—'I do not doubt'—'It is conceivable.'

'For myself, I venture confidently to look back thousands on thousands of generations, and I see an animal striped like a zebra, but perhaps otherwise very differently constructed, the common parent of our domestic horse, whether or not it be descended from one or more wild stocks of the ass, heminus, quagga, or zebra.'—p. 167.

In the name of all true philosophy we protest equally against such a mode of dealing with nature, as utterly dishonourable to all natural science, as reducing it from its present lofty level as one of the noblest trainers of man's intellect and instructors of his mind, to being a mere idle play of the fancy, without the basis of fact or the discipline of observation. In the 'Arabian Nights' we are not offended as at an impossibility when Amins sprinkles her husband with water and transforms him into a dog, but we cannot open the august doors of the venerable temple of scientific truth to genii and magicians of romance. We plead guilty to Mr. Darwin's imputation that

'the chief cause of our natural unwillingness to admit that one species has given birth to other

and distinct species is that we are always slow in admitting any great change of which we do not see the intermediate steps.'—p. 481.

In this tardiness to admit great changes suggested by the imagination, but the steps of which we cannot see, is the true spirit of philosophy.

'Analysis,' says Professor Sedgwick, 'consists in making experiments and observations, and in drawing general conclusions from them by induction, and admitting of no objections against the conclusions but such as are taken from experiments or other certain truths; for hypotheses are not to be regarded in experimental philosophy.'\*

The other solvent which Mr. Darwin most freely and, we think, unphilosophically employs to get rid of difficulties, is his use of time. This he shortens or prolongs at will by the mere wave of his magician's rod. Thus the duration of whole epochs, during which certain forms of animal life prevailed, is gathered up into a point, whilst an unlimited expanse of years, impressing his mind with a sense of eternity, is suddenly interposed between that and the next series, though geology proclaims the transition to have been one of gentle and, it may be, swift accomplishment. All this too is made the more startling because it is used to meet the objections drawn from facts. 'We see none of your works,' says the observer of nature; 'we see no beginnings of the portentous change; we see plainly beings of another order in creation, but we find amongst them no tendencies to these altered organisms.' 'True,' says the great magician, with a calmness no difficulty derived from the obstinacy of facts can disturb; 'true, but remember the effect of time. Throw in a few hundreds of millions of years more or less, and why should not all these changes be possible, and, if possible, why may I not assume them to be real?'

Together with this large licence of assumption we notice in this book several instances of receiving as facts whatever seems to bear out the theory upon the slightest evidence, and rejecting summarily others, merely because they are fatal to it. We grieve to charge upon Mr. Darwin this freedom in handling facts, but truth extorts it from us. That the loose statements and unfounded speculations of this book should come from the author of the monograms on Cirripedes, and the writer, in the natural history of the Voyage of the 'Beagle,' of the paper on the Coral Reefs, is indeed a sad warning how far the love of a theory may seduce even a first-

rate naturalist from the very articles of his creed.

This treatment of facts is followed up by another favourite line of argument, namely, that by this hypothesis difficulties otherwise inextricable are solved. Such passages abound. Take a few, selected almost at random, to illustrate what we mean:—

'How inexplicable are these facts on the ordinary view of creation!'—p. 436.

'Such facts as the presence of peculiar species of bats and the absence of other mammals on oceanic islands are utterly inexplicable on the theory of independent acts of creation.'—pp. 477-8.

'It must be admitted that these facts receive no explanation on the theory of creation.'—p. 478.

'The inhabitants of the Cape de Verde Islands are related to those of Africa, like those of the Galapagos to America. I believe this grand fact can receive no sort of explanation on the ordinary view of independent creation.'—pp. 898-9.

Now what can be more simply reconcilable with that theory than Mr. Darwin's own solution, namely, that these particular islands were peopled from the neighbouring continents to which their animal life is related.

Take another of these suggestions:—

'It is inexplicable, on the theory of creation, why a part developed in a very unusual manner in any one species of a genus, and therefore, as we may naturally infer, of great importance to the species, should be eminently liable to variation.'—p. 474.

Why 'inexplicable?' Such a liability to variation might most naturally be expected in the part 'unusually developed,' because such unusual development is of the nature of a monstrosity, and monsters are always tending to relapse into likeness to the normal type. Yet this argument is one on which he mainly relies to establish his theory, for he sums all up in this triumphant inference:—

'I cannot believe that a false theory would explain, as it seems to me that the theory of natural selection does explain, the several large classes of facts above specified.'—p. 480.

Now, as to all this, we deny, first, that many of these difficulties are 'inexplicable on any other supposition.' Of the greatest of them (128, 194) we shall have to speak before we conclude. We will here touch only on one of those which are continually reappearing in Mr. Darwin's pages, in order to illustrate his mode of dealing with them. He finds, then, one of these 'inexplicable difficulties' in the fact, that the young of the blackbird, instead of resembling the adult in

\* 'A Discourse on the Studies of the University,' by A. Sedgwick, p. 102.

the colour of its plumage, is, like the young of many other birds, spotted, and triumphantly declaring that—

‘No one will suppose that the stripes on the whelp of a lion, or the spots on the young black-bird, are of any use to these animals, or are related to the conditions to which they are exposed.’—pp. 489–40—

he draws from them one of his strongest arguments for this alleged community of descent. Yet what is more certain to every observant field-naturalist than that this alleged uselessness of colouring is one of the greatest protections to the young bird, imperfect in its flight, perching on every spray, sitting unwarily on every bush through which the rays of sunshine dapple every bough to the colour of its own plumage, and so give it a facility of escape which it would utterly want if it bore the marked and prominent colours, the beauty of which the adult bird needs to recommend him to his mate, and can safely bear with his increased habits of vigilance and power of wing?

But, secondly, as to many of these difficulties, the alleged solving of which is one great proof of the truth of Mr. Darwin's theory, we are compelled to join issue with him on another ground, and deny that he gives us any solution at all. Thus, for instance, Mr. Darwin builds a most ingenious argument on the tendency of the young of the horse, ass, zebra, and quagga, to bear on their shoulder and on their legs certain barred stripes. Up these bars (bars sinister, as we think, as to any true descent of existing animals from their fancied prototype) he mounts through his ‘thousands and thousands of generations,’ to the existence of his ‘common parent, otherwise perhaps very differently constructed, but striped like a zebra.’—(p. 67.) ‘How inexplicable,’ he exclaims, ‘on the theory of creation, is the occasional appearance of stripes on the shoulder and legs of several species of the horse genus and in their hybrids!’—(p. 473.) He tells us that to suppose that each species was created with a tendency ‘like this, is to make the works of God a mere mockery and deception;’ and he satisfies himself that all difficulty is gone when he refers the stripes to his hypothetical thousands on thousands of years removed progenitor. But how is his difficulty really affected? for why is the striping of one species a less real difficulty than the striping of many?

Another instance of this want of fairness, to which we must call the attention of our readers, because it too often recurs, is contained in the following question:—

‘Were all the infinitely numerous kinds of

animals and plants created as eggs, or seed, or as full grown? and, in the case of mammals, were they created bearing the false marks of nourishment from the mother's womb?’—p. 483.

The difficulty here glanced at is extreme, but it is one for the solution of which the transmutation-theory gives no clue. It is inherent in the idea of the creation of beings, which are to reproduce their like by natural succession; for, in such a world, place the first beginning where you will, that beginning *must* contain the apparent history of the *past*, which existed only in the mind of the Creator. If, with Mr. Darwin, to escape the difficulty of supposing the first man at his creation to possess in that framework of his body ‘false marks of nourishment from his mother's womb,’ with Mr. Darwin you consider him to have been an improved ape, you only carry the difficulty up from the first man to the first ape; if, with Mr. Darwin, in violation of all observation, you break the barrier between the classes of vegetable and animal life, and suppose every animal to be an ‘improved’ vegetable, you do but carry your difficulty with you into the vegetable world; for, how could there be seeds if there had been no plants to seed them? and if you carry up your thoughts through the vista of the Darwinian eternity up to the primæval fungus, still the primæval fungus must have had humus, from which to draw into its venerable vessels the nourishment of its archetypal existence, and that humus must itself be a ‘false mark’ of a pre-existing vegetation.

We have dwelt a little upon this, because it is by such seeming solutions of difficulties as that which this passage supplies that the transmutationist endeavours to prop up his utterly rotten fabric of guess and speculation.

There are no parts of Mr. Darwin's ingenious book in which he gives the reins more completely to his fancy than where he deals with the improvement of instinct by his principle of natural selection. We need but instance his assumption, without a fact on which to build it, that the marvellous skill of the honey-bee in constructing its cells is thus obtained, and the slave-making habits of the Formica Polyerges thus formed. There seems to be no limit here to the exuberance of his fancy, and we cannot but think that we detect one of those hints by which Mr. Darwin indicates the application of his system from the lower animals to man himself, when he dwells so pointedly upon the fact that it is always the *black* ant which is enslaved by his other coloured and more fortunate brethren. ‘The slaves are black?’ We believe that, if we had Mr. Darwin in the

witness-box, and could subject him to a moderate cross-examination, we should find that he believed that the tendency of the lighter-coloured races of mankind to prosecute the negro slave-trade was really a remains, in their more favoured condition, of the 'extraordinary and odious instinct' which had possessed them before they had been 'improved by natural selection' from *Formica Polyerges* into *Homo*. This, at least, is very much the way in which (p. 479) he slips in quite incidentally the true identity of man with the horse, the bat, and the porpoise:—

'The framework of bones being the same in the hand of a man, wing of a bat, fin of a porpoise, and leg of the horse, the same number of vertebræ forming the neck of the giraffe and of the elephant, and innumerable other such facts, at once explain themselves on the theory of descent with slow and slight successive modifications.'—p. 479.

Such assumptions as these, we once more repeat, are most dishonourable and injurious to science; and though, out of respect to Mr. Darwin's high character and to the tone of his work, we have felt it right to weigh the 'argument' again set by him before us in the simple scales of logical examination, yet we must remind him that the view is not a new one, and that it has already been treated with admirable humour when propounded by another of his name and of his lineage. We do not think that, with all his matchless ingenuity, Mr. Darwin has found any instance which so well illustrates his own theory of the improved descendant under the elevating influences of natural selection exterminating the progenitor whose specialities he has exaggerated as he himself affords us in this work. For if we go back two generations we find the ingenious grandsire of the author of the 'Origin of Species' speculating on the same subject, and almost in the same manner with his more daring descendant. Speaking of the delicate organs of his favourite plants, Dr. Darwin tells us:—

'They now acquire blood more oxygenated by the air; obtain the passion and power of reproduction; are sensible to heat, and cold, and moisture; and become in reality insects fed with honey. . . . I am acquainted with a philosopher, who, contemplating this subject, thinks it *not impossible*' [we beg our readers to notice the exact phrase on which we have had so often to remark in the younger Darwin] 'that the first insects were the anthers or stigmata of flowers, which had by some means loosed themselves from their parent plant; and that many other insects have gradually, in long process of time' [again we beg special attention to the remarkable foreshadowing of the gradual long-time development of the younger Darwin], 'been formed from these; some acquiring wings, others fins,

and others claws' [like Mr. Darwin's bats, and fly-catching bears, and crab-], 'from their ceaseless efforts to procure their food, or to secure themselves from injury. . . . The anthers and stigmata are therefore separate beings.\*

Many of our readers will remember the humour with which Frere and Canning, in the Poetry of the Anti-Jacobin, 'exposed' these philosophical arguments of the last generation. But their illustrations of the system apply so admirably to some of the speculations of our present volume, that we cannot forbear from quoting a few of them:—

'Quere, whether a practical application of this theory would not enable us to account for the genesis or original formation of space itself, in the same manner in which Dr. Darwin has traced the whole of organized creation to his six filaments? We may conceive the whole of our present universe to have been originally concentrated in a single point; we may conceive this primæval point, or punctum saliens of the universe, evolving itself by its own energies, to have moved forward in a right line, *ad infinitum*, till it grew tired; after which the right line which it had generated would begin to put itself in motion in a lateral direction, describing an area of infinite extent. This area, as soon as it became conscious of its own existence, would begin to ascend or descend according as its specific gravity would determine it, forming an immense solid space filled with vacuum, and capable of containing the present universe. Space being thus obtained, and presenting a suitable nidus or receptacle for the accumulation of chaotic matter, an immense deposit of it would be gradually accumulated; after which the filament of fire produced in the chaotic mass by an idiosyncrasy or self-formed habit analogous to fermentation, explosion would take place, suns would be shot from the central chaos, planets from suns, and satellites from planets. In this state of things the filament of organization would begin to exert itself in those independent masses which in proportion to their bulk exposed the greatest surface to light and heat. This filament, *after an infinite series of ages* [the Darwinian eternity], would begin to *ramify*, and its oviparous off-spring would diversify their former habits, so as to accommodate themselves to the various incurabula which Nature had prepared for them' [natural selection, that is to say, in our more modern phraseology, would now be busily at work]. 'Upon this view of things it seems highly probable that the first efforts of Nature terminated in the production of vegetables, and that these, being abandoned to their own *energies*' [or to their struggle for life], 'by degrees detached themselves from the surface of the earth, and supplied themselves with wings and feet, according as their different propensities determined them in favour of aerial and terrestrial existence; and thus, by an inherent disposition to society and civilization, and by a

\* Additional Note xxxix. to Darwin's 'Botanic Garden.'



stronger effort of volition, became men. These in time would restrict themselves to the use of their *hind feet*: their *tails* would gradually rub off by sitting in their caves and huts as soon as they arrived at a domesticated state.'

Mr. Darwin would relieve them of their tails by the simple expedient of disuse, but he would eminently agree with the next suggestion of the Antijacobin writers, who suggest that,—‘Meanwhile the Fuci and Algæ, with the Corallines and Madreporæ, would transform themselves into fish, and would gradually populate all the submarine portion of the globe.’\*

Our readers will not have failed to notice that we have objected to the views with which we have been dealing solely on scientific grounds. We have done so from our fixed conviction that it is thus that the truth or falsehood of such arguments should be tried. We have no sympathy with those who object to any facts or alleged facts in nature, or to any inference logically deduced from them, because they believe them to contradict what it appears to them is taught by Revelation. We think that all such objections savour of a timidity which is really inconsistent with a firm and well-instructed faith:—

‘Let us for a moment,’ profoundly remarks Professor Sedgwick, ‘suppose that there are some religious difficulties in the conclusions of geology. How, then, are we to solve them? Not by making a world after a pattern of our own—not by shifting and shuffling the solid strata of the earth, and then dealing them out in such a way as to play the game of an ignorant or dishonest hypothesis—not by shutting our eyes to facts, or denying the evidence of our senses—but by patient investigation, carried on in the sincere love of truth, and by learning to reject every consequence not warranted by physical evidence.†

He who is as sure as he is of his own existence that the God of Truth is at once the God of Nature and the God of Revelation, cannot believe it to be possible that His voice in either, rightly understood, can differ, or deceive His creatures. To oppose facts in the natural world because they seem to oppose Revelation, or to humour them so as to compel them to speak its voice, is, he knows, but another form of the ever-ready feeble-minded dishonesty of lying for God, and trying by fraud or falsehood to do the work of the God of truth. It is with another and a nobler spirit that the true believer walks amongst the works of nature. The words graven on the everlasting rocks are the words of God, and they are graven by His hand. No more

can they contradict His Word written in His book, than could the words of the old covenant graven by His hand on the stony tables contradict the writings of His hand in the volume of the new dispensation. There may be to man difficulty in reconciling all the utterances of the two voices. But what of that? He has learned already that here he knows only in part, and that the day of reconciling all apparent contradictions between what must agree is nigh at hand. He rests his mind in perfect quietness on this assurance, and rejoices in the gift of light without a misgiving as to what it may discover:—

‘A man of deep thought and great practical wisdom,’ says Sedgwick,\* ‘one whose piety and benevolence have for many years been shining before the world, and of whose sincerity no scoffer (of whatever school) will dare to start a doubt, recorded his opinion in the great assembly of the men of science who during the past year were gathered from every corner of the Empire within the walls of this University, “that Christianity had everything to hope and nothing to fear from the advancement of philosophy.” †

This is as truly the spirit of Christianity as it is that of philosophy. Few things have more deeply injured the cause of religion than the busy, fussy energy with which men, narrow and feeble alike in faith and in science, have bustled forth to reconcile all new discoveries in physics with the word of inspiration. For it continually happens that some larger collection of facts, or some wider view of the phenomena of nature, alter the whole philosophic scheme; whilst Revelation has been committed to declare an absolute agreement with what turns out after all to have been a misconception or an error. We cannot, therefore, consent to test the truth of natural science by the Word of Revelation. But this does not make it the less important to point out on scientific grounds scientific errors, when those errors tend to limit God’s glory in creation, or to gainsay the revealed relations of that creation to Himself. To both these classes of error, though, we doubt not, quite unintentionally on his part, we think that Mr. Darwin’s speculations directly tend.

Mr. Darwin writes as a Christian, and we doubt not that he is one. We do not for a moment believe him to be one of those who retain in some corner of their hearts a secret unbelief which they dare not vent; and we therefore pray him to consider well the grounds on which we brand his speculations

\* ‘A Discourse on the Studies of the University,’ p. 153.

† Speech of Dr. Chalmers at the Meeting of the British Association for the Advancement of Science, June, 1833.

\* ‘Poetry of the Antijacobin,’ p. 110.

† ‘A Discourse on the Studies of the University,’ p. 149.

with the charge of such a tendency. First, then, he not obscurely declares that he applies his scheme of the action of the principle of natural selection to MAN himself, as well as to the animals around him. Now, we must say at once, and openly, that such a notion is absolutely incompatible not only with single expressions in the word of God on that subject of natural science with which it is not immediately concerned, but, which in our judgment is of far more importance, with the whole representation of that moral and spiritual condition of man which is its proper subject-matter. Man's derived supremacy over the earth; man's power of articulate speech; man's gift of reason; man's free-will and responsibility; man's fall and man's redemption; the Incarnation of the Eternal Son; the indwelling of the Eternal Spirit, all are equally and utterly irreconcilable with the degrading notion of the brute origin of him who was created in the image of God, and redeemed by the Eternal Son assuming to himself his nature. Equally inconsistent, too, not with any passing expressions, but with the whole scheme of God's dealings with man as recorded in His word, is Mr. Darwin's daring notion of man's further development into some unknown extent of powers, and shape, and size, through natural selection acting through that long vista of ages which he casts mistily over the earth upon the most favoured individuals of his species. We care not in these pages to push the argument further. We have done enough for our purpose in thus succinctly intimating its course. If any of our readers doubt what must be the result of such speculations carried to their logical and legitimate conclusion, let them turn to the pages of Oken, and see for themselves the end of that path the opening of which is decked out in these pages with the bright hues and seemingly innocent deductions of the transmutation-theory.

Nor can we doubt, secondly, that this view, which thus contradicts the revealed relation of creation to its Creator, is equally inconsistent with the fulness of His glory. It is, in truth, an ingenious theory for diffusing throughout creation the working and so the personality of the Creator. And thus, however unconsciously to him who holds them, such views really tend inevitably to banish from the mind most of the peculiar attributes of the Almighty.

How, asks Mr. Darwin, can we possibly account for the manifest plan, order, and arrangement which pervade creation, except we allow to it this self-developing power through modified descent?

'As Milne-Edwards has well expressed it, Nature is prodigal in variety, but niggard in in-

novation. Why, on the theory of creation, should this be so? Why should all the parts and organs of many independent beings, each supposed to have been separately created for its proper place in nature, be so commonly linked together by graduated steps? Why should not Nature have taken a leap from structure to structure?'—p. 194.

And again:—

'It is a truly wonderful fact—the wonder of which we are apt to overlook from familiarity—that all animals and plants throughout all time and space should be related to each other in group subordinate to group, in the manner which we everywhere behold, namely, varieties of the same species most closely related together, species of the same genus less closely and unequally related together, forming sections and sub-genera, species of distinct genera much less closely related, and genera related in different degrees, forming sub-families, families, orders, sub-classes, and classes.'—pp. 128-9.

How can we account for all this? By the simplest, and yet the most comprehensive answer. By declaring the stupendous fact that all creation is the transcript in matter of ideas eternally existing in the mind of the Most High—that order in the utmost perfectness of its relation pervades His works, because it exists as in its centre and highest fountain-head in Him the Lord of all. Here is the true account of the fact which has so utterly misled shallow observers, that Man himself, the Prince and Head of this creation, passes in the earliest stages of his being through phases of existence closely analogous, so far as his earthly tabernacle is concerned, to those in which the lower animals ever remain. At that point of being, the development of the protozoa is arrested. Through it the embryo of their chief passes to the perfection of his earthly frame. But the types of those lower forms of being must be found in the animals which never advance beyond them—not in man, for whom they are but the foundation for an after-development; whilst he too, Creation's crown and perfection, thus bears witness in his own frame to the law of order which pervades the universe.

In like manner could we answer every other question as to which Mr. Darwin thinks all oracles are dumb unless they speak his speculation. He is, for instance, more than once troubled by what he considers imperfections in Nature's work. 'If,' he says, 'our reason leads us to admire with enthusiasm a multitude of inimitable contrivances in Nature, this same reason tells us that some other contrivances are less perfect.'

'Nor ought we to marvel if all the contrivances in nature be not, as far as we can judge,

absolutely perfect; and if some of them be abhorrent to our idea of fitness. We need not marvel at the sting of the bee causing the bee's own death; at drones being produced in such vast numbers for one single act, with the great majority slaughtered by their sterile sisters; at the astonishing waste of pollen by our fir-trees; at the instinctive hatred of the queen-bee for her own fertile daughters; at ichneumonidæ feeding within the live bodies of caterpillars; and at other such cases. The wonder indeed is, on the theory of natural selection, that more cases of the want of absolute perfection have not been observed.'—p. 472.

We think that the real temper of this whole speculation as to nature itself may be read in these few lines. It is a dishonouring view of nature.

That reverence for the work of God's hands with which a true belief in the All-wise Worker fills the believer's heart is at the root of all great physical discovery; it is the basis of philosophy. He who would see the venerable features of Nature must not seek with the rudeness of a licensed roysterer violently to unmask her countenance; but must wait as a learner for her willing unveiling. There was more of the true temper of philosophy in the poetic fiction of the Pan-ic shriek, than in the atheistic speculations of Lucretius. But this temper must beset those who do in effect banish God from nature. And so Mr. Darwin not only finds in it these bungling contrivances which his own greater skill could amend, but he stands aghast before its mightier phenomena. The presence of death and famine seems to him inconceivable on the ordinary idea of creation; and he looks almost aghast at them until reconciled to their presence by his own theory that 'a ratio of increase so high as to lead to a struggle for life, and as a consequence to natural selection entailing divergence of character and the extinction of less improved forms, is decidedly followed by the most exalted object which we are capable of conceiving, namely, the production of the higher animals' (p. 490). But we can give him a simpler solution still for the presence of these strange forms of imperfection and suffering amongst the works of God.

We can tell him of the strong shudder which ran through all this world when its head and ruler fell. When he asks concerning the infinite variety of these multiplied works which are set in such an orderly unity, and run up into man as their reasonable head, we can tell him of the exuberance of God's goodness and remind him of the deep philosophy which lies in those simple words—'All thy works praise Thee, O God, and thy saints give thanks unto Thee.' For it is one office of redeemed man to collect the inarti-

culate praises of the material creation, and pay them with conscious homage into the treasury of the supreme Lord. Surely the philosophy which penned the following glorious words is just as much truer to nature as it is to revelation than all these speculations of the transmutationist. Having shown, from a careful osteological examination of his structure, from his geographical distribution, from the differences and agreements of the several specimens of the human family, and from the changes which step by step we can trace wrought by domestication and variation in the lower animals, that man is not and cannot be an improved ape, Professor Owen adds:—

'The unity of the human species is demonstrated by the constancy of those osteological and dental characters to which the attention is more particularly directed in the investigation of the corresponding characters of the higher quadrupeds. Man is the sole species of his genus, the sole representative of his order and subclass. Thus I trust has been furnished the confutation of the notion of a transformation of the ape into the man, which appears from a favourite old author to have been entertained by some in his day:—

"And of a truth, vile epicurism and sensuality will make the soul of man so degenerate and blind, that he will not only be content to slide into brutish immorality, but please himself in this very opinion that he is a real brute already, an ape, satyr, or baboon; and that the best of men are no better, saving that civilising of them and industrious education has made them appear in a more refined shape, and long inculcated precepts have been mistaken for con-nate principles of honesty and natural knowledge; otherwise there be no indispensable grounds of religion and virtue but what has happened to be taken up by over-ruling custom, which things, I dare say, are as easily computable as any conclusion in mathematics is demonstrable. But as many as are thus sottish, let them enjoy their own wildness and ignorance; it is sufficient for a good man that he is conscious unto himself that he is more nobly descended, better bred and born, and more skilfully taught by the purged faculties of his own mind." \*—*Owen's Classification of Mammals*, p. 103.

And he draws these truly philosophical views to this noble conclusion.

'Such are the dominating powers with which we, and we alone, are gifted! I say gifted, for the surpassing organisation was no work of ours. It is He that hath made us, not we ourselves. This frame is a temporary trust, for the use of which we are responsible to the Maker. Oh! you who possess it in all the supple vigour of lusty youth, think well what it is that He has committed to your keeping. Waste not its energies; dull them not by sloth; spoil them not by pleasures!

'The supreme work of creation has been ac-

\* Henry More's *Conjectura Cabbalistica*, fol. (1662), p. 175.

complished that you might possess a body—the sole erect—of all animal bodies the most free—and for what? for the service of the soul.

'Strive to realise the conditions of this wondrous structure. Think what it may become—the Temple of the Holy Spirit!

'Defile it not. Seek rather to adorn it with all meet and becoming gifts, with that fair furniture, moral and intellectual, which it is your inestimable privilege to acquire through the teachings and examples and ministrations of this seat of sound learning and religious education.'—p. 50.

Equally startling is the contrast between the flighty anticipations of the future in which Mr. Darwin indulges, and the sober philosophy with which Owen restrains the flight of his own more soaring imagination;—

'In the distant future I see,' says Darwin, 'open fields for far more important researches. Psychology will be based on a new foundation—that of the necessary acquirement of each mental power and capacity by gradation. Light will be thrown on the origin of man and his history.'—pp. 488-9.

'Judging from the past, we may safely infer that not one living species will transmit its unaltered likeness to a distant futurity, and of the species now living very few will transmit progeny to a far-distant futurity. . . . We may look with some confidence to a secure future of equally inappreciable length. And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress towards perfection.'—p. 489.

'There is grandeur in this view of life, with its several powers, and having been originally breathed by the creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been and are being evolved!'—p. 490.

Surely there is a far grander tone of vaticination about these words of caution from a far greater philosopher:—

'As to the successions or coming in of new species, one might speculate on the gradual modifiability of the individual; on the tendency of certain varieties to survive local changes, and thus progressively diverge from an older type; on the production and fertility of monstrous offspring; on the possibility, e. g. of a variety of auk being occasionally hatched with a somewhat longer winglet and a dwarfed stature; on the probability of such a variety better adapting itself to the changing climate or other conditions than the old type; of such an origin of *Alca torda*, e. g.;—but to what purpose? Past experience of the chance-aims of human fancy, unchecked and unguided by observed facts, shows how widely they have ever glided away from the gold centre of truth.'—Owen on the Classification of Mammalia, p. 58.

'Turning from a retrospect into past time for

the prospect of time to come . . . . . I may crave indulgence for a few words. . . .

. . . . . There seems to have been a time when life was not; there may, therefore, be a period when it will cease to be. . . . .

. . . . . The end of the world has been presented to man's mind under divers aspects:—as a general conflagration; as the same, preceded by a millennial exaltation of the world to a paradisiacal state, the abode of a higher and blessed state of intelligences. If the guide-post of palæontology may seem to point to a course ascending to the condition of the latter speculation, it points but a very short way, and on leaving it we find ourselves in a wilderness of conjecture, where to try to advance is to find ourselves "in wandering mazes lost."—p. 61.

It is by putting such a restraint upon fancy that science is made the true trainer of our intellect:—

'A study of the Newtonian philosophy,' says Sedgwick, 'as affecting our moral powers and capacities, does not terminate in mere negations. It teaches us to see the finger of God in all things animate and inanimate, and gives us an exalted conception of His attributes, placing before us the clearest proof of their reality; and so prepares, or ought to prepare, the mind for the reception of that higher illumination which brings the rebellious faculties into obedience to the Divine will.'—*Studies of the University*, p. 14.

It is by our deep conviction of the truth and importance of this view for the scientific mind of England that we have been led to treat at so much length Mr. Darwin's speculation. The contrast between the sober, patient, philosophical courage of our home philosophy, and the writings of Lamarck and his followers and predecessors, of MM. Demaillet, Bory de Saint-Vincent, Virey, and Oken,\* is indeed most wonderful; and it is greatly owing to the noble tone which has been given by those great men whose words we have quoted to the school of British science. That Mr. Darwin should have wandered from this broad highway of nature's works into the jungle of fanciful assumption is no small evil. We trust that he is mistaken in believing that he

\* It may be worth while to exhibit to our readers a few of Dr. Oken's postulates or arguments as specimens of his views:—

'I wrote the first edition of 1810 in a kind of inspiration.

4. Spirit is the motion of mathematical ideas.

10. Physio-philosophy has to . . . portray the first period of the world's development from nothing; how the elements and heavenly bodies originated; in what method by self-evolution into higher and manifold forms they separated into minerals, became finally organic, and in man attained self-consciousness.

42. The mathematical monad is eternal.

43. The eternal is one and the same with the zero of mathematica.'

may count Sir C. Lyell as one of his converts. We know indeed the strength of the temptations which he can bring to bear upon his geological brother. The Lyellian hypothesis, itself not free from some of Mr. Darwin's faults, stands eminently in need for its own support of some such new scheme of physical life as that propounded here. Yet no man has been more distinct and more logical in the denial of the transmutation of species than Sir C. Lyell, and that not in the infancy of his scientific life, but in its full vigour and maturity.

Sir C. Lyell devotes the 33rd to the 36th chapter of his 'Principles of Geology' to an examination of this question. He gives a clear account of the mode in which Lamarck supported his belief of the transmutation of species; he 'interrupts the author's argument to observe that no positive fact is cited to exemplify the substitution of some *entirely new* sense, faculty, or organ—because no examples were to be found;' and remarks that when Lamarck talks of 'the effects of internal sentiment,' &c., as causes whereby animals and plants may acquire *new organs*, he substitutes names for things, and with a disregard to the strict rules of induction resorts to fictions.

He shows the fallacy of Lamarck's reasoning, and by anticipation confutes the whole theory of Mr. Darwin, when gathering clearly up into a few heads the recapitulation of the whole argument in favour of the reality of species in nature. He urges:—

1. That there is a capacity in all species to accommodate themselves to a certain extent to a change of external circumstances.

4. The entire variation from the original type . . . may usually be effected in a brief period of time, after which no further deviation can be obtained.

5. The intermixing distinct species is guarded against by the sterility of the mule offspring.

6. It appears that species have a real existence in nature, and that each was endowed at the time of its creation with the attributes and organization by which it is now distinguished.\*

We trust that Sir C. Lyell abides still by these truly philosophical principles; and that with his help and with that of his brethren this flimsy speculation may be as completely put down as was what in spite of all denials we must venture to call its twin though less-instructed brother, the 'Vestiges of Creation.' In so doing they will assuredly provide for the strength and continually growing progress of British science.

Indeed, not only do all laws for the study of nature vanish when the great principle of order pervading and regulating all her processes is given up, but all that imparts the deepest interest in the investigation of her wonders will have departed too. Under such influences man soon goes back to the marvelling stare of childhood at the centaurs and hippogriffs of fancy, or if he is of a philosophic turn, he comes like Oken to write a scheme of creation under a 'sort of inspiration;' but it is the frenzied inspiration of the inhaler of mephitic gas. The whole world of nature is laid for such a man under a fantastic law of glamour, and he becomes capable of believing anything: to him it is just as probable that Dr. Livingstone will find the next tribe of negroes with their heads growing under their arms as fixed on the summit of the cervical vertebræ; and he is able, with a continually growing neglect of all the facts around him, with equal confidence and equal delusion, to look back to any past and to look on to any future.

ART. VIII.—1. *Mr. Horsman's Speeches on the withdrawal of the Reform Bill, and on Lord Palmerston's Resolutions.* 'Times,' June 11, and July 7, 1860.

2. *Church-Rates and Endowed Schools.* A Charge. By Archdeacon Thorpe. London, 1860.

3. *Address on the present State of the Church-Rate Question.* By the Committee of Laymen. London.

4. *The Gazette of the Association for promoting the Repeal of Taxes on Knowledge,* No. 30. 1860.

5. *The Census and the Church-Rate.* A Charge. By the Archdeacon of Barnstaple. London, 1860.

THE comet which is supposed to have played such eccentric pranks with our weather during the last two years seems to have impressed some of its wayward influence on our politics as well. The changes of feeling have been so rapid, the turns of fortune so unexpected, that the most self-confident observers have almost given up the ingenious pastime of political prediction. Prophets, in these later days, have not been remarkable for infallibility; but time was when it took at least years to discredit a well-considered prophecy. We all know that war has not turned out to be an obsolete barbarism, as was predicted in 1847, and that Russia has not been crumpled

\* 'Principles of Geology,' edit. 1853.