

ART. II—DARWINISM.

An Exposition of the Theory of Natural Selection, with some of its Applications. By ALFRED RUSSEL WALLACE, LL.D., F.L.S., &c. London: Macmillan & Co. 1839.

ACCORDING to promise, we now propose to consider carefully the above interesting volume, briefly noticed by us in our last issue. To consider it carefully, however, it is by no means necessary to pass in review any large portion of the mass of details and varied subjects it contains. It will be amply sufficient for our purpose to note certain of the author's essential principles which appear to us to bear with decisive effect upon the validity of the hypothesis Mr. Wallace sets out to defend. His defence does merit practical consideration, for though it appears in the guise of an onslaught upon the Anti-Darwinian forces, it is in fact a last defence on the part of the surviving chief of the encompassed and besieged citadel of Darwinism.

Attention and consideration the work must certainly command, owing to the attractive style in which it is written, and the multitude of interesting natural-history details with which it is filled. In these respects it only harmonizes with Mr. Wallace's previous works, all of which are full of charm for the student of nature.

After explaining what he means by "species" and their "origin," Mr. Wallace proceeds to treat, in a succession of chapters, of "the struggle for existence," "variation" and "selection;" certain difficulties and objections; hybridism, coloration, geographical and geological relations, and the question of man.

In his chapter on the struggle for existence, Mr. Wallace makes some excellent remarks on the sufferings of animals. He observes (p. 37):—

There is, I think, good reason to believe that all this (*i.e.*, certain assertions made by Professor Huxley) is greatly exaggerated; that the supposed "torments" and "miserias" of animals have little real existence, but are the reflection of the imagined sensations of cultivated men and women in similar circumstances; and that the amount of actual suffering caused by the struggle for existence among animals is altogether insignificant. In the first place, we must remember that animals are entirely spared the pain we suffer in the anticipation of death—a pain far greater, in most cases, than the reality. This leads, probably, to an almost perpetual enjoyment of their lives, since their constant watchfulness against danger, and even their actual flight from

an enemy, will be the enjoyable exercise of the power and faculties they possess, unmixed with any serious dread. There is, in the next place, much evidence to show that violent deaths, if not too prolonged, are painless and easy; even in the case of man, whose nervous system is in all probability much more susceptible to pain than that of most animals. In all cases in which persons have escaped after being seized by a lion or tiger, they declare that they suffered little or no pain, physical or mental. A well-known instance is that of Livingstone, who thus describes his sensations when seized by a lion:—"Starting and looking half round, I saw the lion just in the act of springing on me. I was upon a little height: he caught my shoulder as he sprang, and we both came to the ground below together. Growling horribly close to my ear, he shook me as a terrier-dog does a rat. The shock produced a stupor similar to that which seems to be felt by a mouse after the first shake of the cat. It causes a sort of dreaminess, in which there was no sense of pain or feeling of terror, though I was quite conscious of all that was happening. It was like what patients partially under the influence of chloroform describe, who see all the operations, but feel not the knife. This singular condition was not the result of any mental process. The shake annihilated fear, and allowed no sense of horror in looking round at the beast."

This absence of pain is not peculiar to those seized by wild beasts, but is equally produced by any accident which causes a general shock to the system. Mr. Whymper describes an accident to himself during one of his preliminary explorations of the Matterhorn, when he fell several hundred feet, bounding from rock to rock, till fortunately embedded in a snow-drift near the edge of a tremendous precipice. He declares that while falling, and feeling blow after blow, he neither lost consciousness nor suffered pain, merely thinking calmly that a few more blows would finish him. We have, therefore, a right to conclude that when death follows soon after any great shock, it is as easy and painless a death as possible, and this is certainly what happens when an animal is seized by a beast of prey. For the enemy is one which hunts for food, not for pleasure or excitement, and it is doubtful whether any carnivorous animal in a state of nature begins to seek after prey till driven to do so by hunger. When an animal is caught, therefore, it is very soon devoured, and thus the first shock is followed by an almost painless death. Neither do those which die of cold or hunger suffer much. Cold is generally severest at night, and has a tendency to produce sleep and painless extinction. Hunger, on the other hand, is hardly felt during periods of excitement; and when food is scarce the excitement of seeking for it is at its greatest. It is probable, also, that when hunger presses, most animals will devour anything to stay their hunger, and will die of gradual exhaustion and weakness not necessarily painful, if they do not fall an earlier prey to some enemy or to cold.

Now let us consider what are the enjoyments of the lives of most animals. As a rule, they come into existence at a time of year when food is most plentiful and the climate most suitable, that is, in the spring of the temperate zone and at the commencement of the dry

season in the tropics. They grow vigorously, being supplied with abundance of food ; and when they reach maturity their lives are a continual round of healthy excitement and exercise, alternating with complete repose. The daily search for the daily food employs all their faculties, and exercises every organ of their bodies. while this exercise leads to the satisfaction of all their physical needs.

In our own case, we can give no more perfect definition of happiness than this exercise and this satisfaction ; and we must therefore conclude that animals, as a rule, enjoy all the happiness of which they are capable. And this normal state of happiness is not allayed, as with us, by long periods—whole lives often—of poverty or ill-health, and of the unsatisfied longing for pleasures which others enjoy, but to which we cannot attain. Illness, and what answers to poverty in animals—continued hunger, are quickly followed by unanticipated and almost painless extinction. Where we err is, in giving to animals feelings and emotions which they do not possess. To us the very sight of blood, and of torn and mangled limbs, is painful, while the idea of the suffering implied by it is heartrending. We have a horror of all violent and sudden death, because we think of the life full of promise cut short, of hopes and expectations unfulfilled, and of the grief of mourning relatives. But all this is quite out of place in the case of animals, for whom a violent and a sudden death is in every way the best. Thus the poet's picture of

" Nature red in tooth and claw
With ravine,"

is a picture, the evil of which is read into it by our imaginations, the reality being made up of full and happy lives, usually terminated by the quickest and least painful of deaths.

We have cited this passage at length, because we consider it a very salutary antidote to the poisonous pessimism with regard to nature which is not unknown even amongst ourselves.

That "natural selection" acts—that, as we have elsewhere said, "it restrains variation within the bounds of physiological propriety"—is what we have constantly affirmed ; and no thoughtful person for centuries past has denied the truth, familiar to the scholastic, that even no trees in a forest are absolutely similar.

What we have also affirmed, and what Mr. Wallace cannot bring evidence to refute, is that variation can neither be indefinite nor unlimited. He shows abundantly that there may be much oscillation on either side of a mean, and this is made especially evident in two diagrams of variations in birds, depicted on pages 63-65. We strongly suspect, however, that close criticism would reduce or invalidate not a few of his instances. We judge this from his diagram of variations in lizards, which is exclusively based upon measurements taken by Professor Milne-Edwards very many years ago, without note of sex and of most doubtful accuracy

as to specific distinctions. These measurements and Mr. Wallace's diagram (p. 48) must be entirely disregarded on these accounts, and such a failure in one instance throws grave doubts and and suspicion upon others.

The one supereminent characteristic of Darwinism is that the mere fact of the position it assumes renders refutation extremely difficult. It says the cause of every characteristic organization and every habit or instinct is "utility"—a utility either existing at the present time, or utility in the past to some hypothetical ancestors under some imaginable circumstances. This hypothetical proposition having been affirmed, ignorance is constantly appealed to as evidence in its favour. It is obviously impossible to deny that we are ignorant as to such past possibilities, nor would a Theist seek to maintain that the organization of any animal is futile and useless. Did we all, then, know even by certain revelation that Darwinism was false, the arguments in its favour derived from ignorance and from mere possibilities, would remain as plausible as ever. Thus as to the origin of the mammary gland Mr. Wallace remarks (p. 129), that "the very earliest mammals . . . may have been nourished by a fluid secreted from the interior surface of the marsupial sack. And who can reply that this is impossible, although there is much reason to doubt whether the first mammals had any marsupial sack at all? These appeals to ignorance occur again and again, *usque ad nauseam*.

The case of the Potto, however, the first finger of which is quite rudimentary, remains as significant as ever. All that Mr. Wallace can say in reply to our previous objections, drawn from that source, is (p. 139) that it is an "ancient type," and that its habits and past history are completely unknown. We consider, therefore, the case of the Potto (which must grasp the less securely from the absence of this finger) to be as triumphantly decisive as any such case can be, though, of course, we cannot say that accompanying that character there may not be some favourable peculiarity of heart, lungs, liver, brain, which may give it a physiological superiority. Another still more striking instance of the preservation of an apparently rather harmful characteristic is that power which certain plants possess of forming galls when pierced by the insect Cynips, as mentioned in our last issue,* although, as we then said, no doubt some Darwinian will explain it by piling hypothesis on hypothesis for the purpose.

It is a notorious fact that, from whatever cause, hybrids are apt to be sterile *inter se*, though they are by no means universally

so. It is also notorious that, from whatever cause, close interbreeding does produce bad effects.

Now, when Mr. Wallace comes to speak (p. 163) of hybrid plants, after mentioning a case in which "after a time the fertility decreased," he adds "presumably from the same cause, too close interbreeding." But the presumption is unwarranted, for it is surely quite as open to me to believe that the infertility in this case was due to the same cause as that which occasions the admitted general infertility of hybrids, which are instances of the very opposite to interbreeding. Mr. Wallace fully admits (p. 195) that changes of colour in animals, produced by the tints of surrounding objects, do occur; but he endeavours to attenuate the admission by saying, that "these facts are comparatively rare and exceptional in their nature,"—as if the admission of the *principle* that such direct action could take place, had not the most far-reaching consequences. We have sometimes to be grateful to him (and we gladly record it) for exposing the fallacies of some of his Darwinian brothers. Thus he observes (p. 198): "It is curious that, with the small tortoise-shell larva, exposure to light from gilded surfaces produced pupæ with a brilliant golden lustre; and the explanation is supposed to be that *mica abounded in the original habitat* of the species, and that the pupæ thus obtained protection when suspended against micaceous rock. Looking, however, at the wide range of the species, and the comparatively limited area in which micaceous rocks occur, this seems a rather improbable explanation, and the occurrence of this metallic appearance is still a difficulty." All honour to Mr. Wallace for this straightforward admission!

Some very far-fetched and untenable fancies are, however, put forward by him to explain other phenomena. Thus he tells us that the giraffes' heads and horns are liable to be mistaken for broken branches, and evidently supposes (p. 210) that the forked and blood-red tentacle which can be projected from the heads of the caterpillars of certain butterflies, has been formed by gradual growth through its protecting action against enemies. He further tells us that, "perhaps the most perfect example of this kind of protection is exhibited by the large caterpillar of the Royal Persimmon Moth (*Bombyx regia*), a native of the Southern States of North America, and known there as the "Hickory-horned Devil."

It is a large green caterpillar, often six inches long, ornamented with an immense crown of orange-red tubercles, which, if disturbed, it erects, and shakes from side to side in a very alarming manner. In its native country the negroes believe it to be as deadly as a rattlesnake, whereas it is perfectly innocuous. The green colour of the body suggests that its ancestors were once protectively coloured; but

growing too large to be effectually concealed, it *acquired the habit of shaking its head about* in order to frighten away its enemies, and ultimately developed the crown of tentacles as an addition to its terrifying powers.

The faith which would accept such a legend as this as the very truth is past arguing with.

But scepticism and credulity go hand in hand through the whole of this work. At page 215 we read: "The beautiful blue or greenish eggs of the hedge-sparrow, the song-thrush, the black-bird, and the lesser redpole seem, at first sight, especially calculated to attract attention, but *it is very doubtful* whether they are really so conspicuous when seen at a little distance among their usual surroundings"—dark or delicate green leaves. Now, *of course*, the eggs are less conspicuous "when seen at a little distance in the nest," than they are when held in the hand or laid down on a library table. But this fact in no way makes them less conspicuous objects as compared with the eggs of various other birds, which do almost perfectly harmonize with their environment.

In the same way he seeks to account for the instinct which leads so many cuckoos to lay their eggs in the nests of birds whose eggs are similarly coloured, by saying (p. 216), "Those cuckoos which so acted would probably leave most progeny, and so the habit would grow." No doubt Mr. Wallace would similarly account for the very small size of the cuckoo's eggs; but, as Messrs. Geddes and Thomson have lately observed,* "To say that the small size of the cuckoo's egg is 'an adaptation in order to deceive the small birds,' seems to strain the natural-selection theory to the breaking-point."

The beauty of many birds is explained by Mr. Wallace by the need of each species to easily recognise its kind. Now our position by no means requires us to assert that different species must be so alike that no one of them can recognise its own kind. The differences here referred to are thus useful, and such utility was, no doubt, one amongst the many causes which led to the beauty of birds-of-paradise and humming-birds. As to the latter, the Duke of Argyll most justly remarks:—"A crest of topaz is no better in the struggle for existence than a crest of sapphire. A frill ending in spangles of the emerald is no better in the battle of life than a frill ending in spangles of the ruby." One final cause of such beauties may well have been their ultimate appreciation by human intelligences and by intelligences higher than human. Many concordant utilities may run parallel, and it would be strange indeed if we had to show that

* "Evolution of Sex," p. 277.

any characters were utterly and altogether useless, in order that we might prove *design*. But that the bare and bold utilitarianism of Darwin is not the be-all and end-all of nature, we may cite facts from Mr. Wallace himself to prove. The resemblance of butterflies of different kinds, Darwinians usually explain by the fact that one kind is uneatable, and that the other kind gains impunity by resembling its distasteful class-fellow. But there are swallow-tailed butterflies in Asia and Africa which are both distasteful; yet, though thus alike in this respect, while widely separated geographically, "they have each the same red and black colours," and "are very distinct from all the other butterflies of their respective countries."

Well may Mr. Wallace remark of this fact (p. 235) that "it is curious." He is wonderfully fertile of resources in the way of explanation, so that the most contradictory facts can be equally well explained upon his pet hypothesis—a fact which surely suggests grave doubts as to its validity on the part of impartial readers. After speaking of the unsavoury and offensive nature of many brilliant sea-anemones, and seeking to explain their brilliance as a useful sign to ward off attacks, he adds (p. 265):—"Some tropical fishes, however, seem to have acquired the power of feeding on corals and medusæ; and the beautiful bands and spots, and bright colours, with which they are frequently adorned, may be either protection when feeding in the submarine coral-groves, or may, in some cases, be warning colours to show that they themselves are poisonous and uneatable."

Similarly, he generally explains the formation of domed nests as a means of hiding conspicuous birds within them; but when this course does not appear possible, his fancy is immediately ready to suggest another cause. Thus as to the Maluridæ of Australia he remarks (p. 279):—"Here *there can be little doubt* the covered nest is a protection from rain or from some special enemies of the eggs." Mr. Wallace's fertile fancy is, indeed, one of his most notable characteristics, and it is displayed in this work in a truly noteworthy manner. Thus, after arguing as to circumstances which might have caused plants to be fertilised by insects, he continues (p. 328):—

Species thus favourably modified *might* begin a new era of development, and while spreading over a somewhat wider area, give rise to new varieties or species, all adapted in various degrees and modes to secure cross-fertilisation by insect agency. But, in course of ages, *some* change of condition *might* prove adverse. Either the insects required *might* diminish in numbers *or* be attracted by other competing flowers, or a change of climate *might* give the advantage to other more vigorous plants. Then self-fertilisation, with greater means of dispersal, *might* be more advantageous; the flowers *might* become

smaller and more numerous; the seeds smaller and lighter, so as to be more easily dispersed by the wind; while some of the special adaptations for insect fertilisation, being useless, would, by the absence of selection and by the loss of economy of growth, be reduced to a rudimentary form. With these modifications the species *might* extend its range into new districts, thereby obtaining increased vigour by the change of conditions, as appears to have been the case with so many of the small-flowered self-fertilised plants. Thus it *might* continue to exist for a long series of ages, till, under *other* changes, geographical or biological, it *might* again suffer from competition or from *other adverse circumstances*, and be at length again confined to a limited area, or reduced to very scanty members.

What *might* not be explained by such chains of imaginary hypotheses? We are irresistibly reminded of the old tale about the girl found crying beside a well, and who, being asked the reason of her tears, replied, "Oh, sir, I *might* live to be a woman, and I *might* be married, and I *might* have a little girl, and I *might* send her to this well, and she *might* fall in, and *might* be drowned; and what a shocking thing that would be!"

Mr. Wallace does not contest the plain fact that dicotyledonous plants appear suddenly in abundance in the Cretaceous period, while in the earlier Mesozoic formations we seem to have, as he admits, "a fair representative of the flora of the period," amongst which were many monocotyledons, and in his diagram (p. 202) he plainly represents the latter group as antedating the former. Yet he appears to favour the view that monocotyledons are degraded dicotyledons.

He endeavours to account for the occurrence of similar plants at very distant stations by the hypothesis (p. 371) of the wind-carriage of their seeds, justly declaring (p. 369) Mr. Darwin's view of an extreme lowering of tropical temperature during comparatively recent times, to be an untenable view. But we cannot believe with our author that the wind could carry sands from Northern Europe to New Zealand or Tierra-del-Fuego, or between Australia and South America. We are confirmed in this disbelief by the fact that closely resembling snakes, lizards, insects, and plants exist in Madagascar and South America, for which no wind agency will, of course, account. We have, indeed, met with no Darwinian hypothesis which will account for it, any more than for the similarity between certain Batrachians of Europe and South America.

But not to linger over a criticism of mere details, we will devote the rest of the space at our disposal to the consideration of three principles, all of which are admitted by Mr. Wallace, but any one of which is simply fatal to that mechanical conception of nature which it is our intention, as ever before, to oppose.

We have, indeed, little need and less desire to oppose Mr. Wallace for his own sake; for the views peculiar to himself would be, if true, perfectly harmless. We oppose him only because, and in so far as, his work, so unfortunately misnamed, is taken to support true Darwinism, which affirms the bestiality of man, and practically enthrones unreason as Lord of the Universe.

The three principles to which it is the main object of this paper to direct attention are—(1) Mr. Wallace's hypothesis as to the development of colour in animals; (2) his view as to the origin of man; and (3) his conviction as to the immaterial dynamic side of the bodies which constitute the Material Universe.

The brilliant colours, peculiar markings or structural developments which so commonly distinguish male animals were explained by Darwin through what he called "sexual selection." He believed that the females, by persistently favouring those males which had such peculiarities in the most marked degree, had given rise to races and species such as now we see them. This view Mr. Wallace rejects, arguing that there is no sufficient evidence of females being thus affected, while he reasonably urges the extreme improbability that one uniform caprice of taste should animate all the females of a species for thousands of generations over vast tracts of country, sometimes extending over almost the whole habitable world. Mr. Wallace explains the difference of the sexes in quite another fashion. According to him, the soberness of female birds is due to the action of natural selection, which has eliminated all those which persisted in retaining the bright colours of the other sex. These imprudent females have, he says, been eliminated by the various beasts and birds of prey which were enabled to obtain them, through the conspicuousness of their coloration, while incubating on their nests. The brilliance of the male birds Mr. Wallace attributes negatively to their not practising incubation, and therefore not needing such protection; while he attributes it positively to general laws of growth and development, ornament being "the natural product and direct outcome of superabundant health and vigour."

He tells us (p. 275): "There seems to be a constant tendency in the male of most animals—but especially of birds and insects—to develop more and more intensity of colour, often culminating in brilliant blues or greens, or the most splendid iridescent hues. He also quotes (p. 296) with approval the following suggestive remarks of that well-known and eminent naturalist, the Rev. O. Pickard-Cambridge:—"I myself doubt that particular application of the Darwinian theory which attributes male peculiarities of form and structure, colour and ornament, to female predilection. There is, it seems to me, undoubtedly something in the male

organization of a special nature, which, of its own vital force, develops the remarkable male peculiarities so commonly seen, and of no imaginable use to that sex."

In this opinion Mr. Wallace is partly supported by a distinguished American biologist, Mr. Brooks.* He has directed our attention to cases of coloration in lizards and fishes, which do not incubate, and to domestic birds, which breed in security. He also remarks that the fact of many structures, which are not at all conspicuous, being confined, like gay plumage, to male birds, also indicates the existence of an explanation of a fundamental nature, and one capable of explaining why the females of allied species should often be exactly alike when the males are very different.

It is strange indeed that Mr. Wallace does not appear to see the serious consequences, for his pet theory, which follow from the affirmation of such principles as these. For if the brilliant colours which decorate and distinguish the males of so many birds and insects are the spontaneous outcome of the inner nature of such organisms, how can it be pretended that they are also due to the action of natural selection? But if species thus distinguished do thus owe their distinction to something else than natural selection, then natural selection can no longer be asserted to be *the* origin of species.

Far more important than Mr. Wallace's treatment of this question, however, are his views concerning the origin of man. As to this, he tells us that even if we allow man's body to have been naturally evolved, it by no mean follows that his mental nature has been produced in a similar fashion, and he denies altogether that it can have been due to the action of "natural selection."

He illustrates the position he thus takes up by the following physical analogy (p. 463):—

Upheaval and depression of land, combined with sub-aërial denudations by wind and frost, rain and rivers, and marine denudations on coast-lines, were long thought to account for all the modelling of the earth's surface not directly due to volcanic action; and in the early editions of "Lyall's Principles of Geology" these are the sole causes appealed to. But when the action of glaciers was studied, and the recent occurrence of a glacial epoch demonstrated as a fact, many phenomena—such as moraines and other gravel deposits, boulder clay, erratic boulders, grooved and rounded rocks, and Alpine lake basins—were seen to be due to this altogether distinct cause. There was no breach of continuity, no sudden catastrophe; the cold period

* See his work entitled, "The Law of Heredity: a Study of the Cause of Variation and the Origin of Living Organisms." Baltimore, 1883.

came on and passed away in the most gradual manner, and its effects often passed insensibly into those produced by denudation or upheaval; yet none the less a new agency appeared at a definite time, and new effects were produced, which, though continuous with preceding effects, were not due to the same causes. It is not, therefore, to be assumed, without proof or against independent evidence, that the later stages of an apparently continuous development are necessarily due to the same causes only as the earlier stages. Applying this argument to the case of man's intellectual and moral nature, I propose to show that certain definite portions of it could not have been developed by variation and natural selection alone, and that, therefore, some other influence, law, or agency is required to account for them. If this can be clearly shown for any one or more of the special faculties of intellectual man, we shall be justified in assuming that the same unknown cause or power may have a much wider influence, and may have profoundly influenced the whole course of this development.

With respect to the mathematical faculty, he asks how its rudiments can have developed into the perfection displayed by a Newton, a La Place, a Gauss or a Cayley. As to this he says (p. 466):—

It must be remembered we are here dealing solely with the capability of the Darwinian theory to account for the origin of the mind, as well as it accounts for the origin of the body of man, and we must, therefore, recall the essential features of that theory. These are, the preservation of useful variations in the struggle for life; that no creature can be improved beyond its necessities for the time being; that the law acts by life and death, and by the survival of the fittest. We have to ask, therefore, what relation the successive stages of improvement of the mathematical faculty had to the life or death of its possessors; to the struggles of tribe with tribe, or nation with nation; or to the ultimate survival of one race and the extinction of another. If it cannot possibly have had any such effects, then it cannot have been produced by natural selection.

From the mathematical he turns to the musical and artistic faculties, as to which he observes as follows (p. 468):—“As with the mathematical, so with the musical faculty, it is impossible to trace any connection between its possession and survival in the struggle for existence. It seems to have arisen as a *result* of social and intellectual advancement, not as a *cause*; and there is some evidence that it is latent in the lower races, since, under European training, native military bands have been formed in many parts of the world, which have been able to perform creditably the best modern music.

“The artistic faculty has run a somewhat different course, though analogous to that of the faculties already discussed. Most savages exhibit some rudiments of it, either in drawing or carving human or animal figures; but, almost without exception, these

figures are rude and such as would be executed by the ordinary inartistic child. In fact, modern savages are, in this respect, hardly equal to those prehistoric men who represented the mammoth and the reindeer on pieces of horn or bone. With any advance in the arts of social life, we have a corresponding advance in artistic skill and taste, rising very high in the arts of Japan and India, but culminating in the marvellous sculpture of the best period of Grecian history. In the Middle Ages art was chiefly manifested in ecclesiastical architecture and the illumination of manuscripts; but from the thirteenth to the fifteenth centuries pictorial art revived in Italy, and attained to a degree of perfection which has never been surpassed. This revival was followed closely by the schools of Germany, the Netherlands, Spain, France, and England, showing that the true artistic faculty belonged to no one nation, but was fairly distributed among the various European races.

“These several developments of the artistic faculty, whether manifested in sculpture, painting, or architecture, are evidently outgrowths of the human intellect which have no immediate influence on the survival of individuals or of tribes, nor on the success of nations in their struggles for supremacy or for existence. The glorious art of Greece did not prevent the nation falling under the sway of the less-advanced Romans; while we ourselves, among whom art was the latest to arise, have taken the lead in the colonisation of the world, thus proving our mixed race to be the fittest to survive.”

He sums up his views as to these matters in the following very noteworthy manner (p. 474-476):—

The special faculties we have been discussing clearly point to the existence in man of something which he has not derived from his animal progenitors—something which we may best refer to as being of a spiritual essence or nature, capable of progressive development under favourable conditions. On the hypothesis of this spiritual nature, superadded to the animal nature of man, we are able to understand much that is otherwise mysterious or unintelligible in regard to him, especially the enormous influence of ideas, principles, and beliefs over his whole life and actions. Thus alone we can understand the constancy of the martyr, the unselfishness of the philanthropist, the devotion of the patriot, the enthusiasm of the artist, and the resolute and persevering search of the scientific worker after nature's secrets. Thus we may perceive that the love of truth, the delight in beauty, the passion for justice, and the thrill of exultation with which we hear of any act of courageous self-sacrifice, are the workings within us of a higher nature which has not been developed by means of the struggle for material existence.

It will, no doubt, be urged that the admitted continuity of man's progress from the brute does not admit of the introduction of

new causes, and that we have no evidence of the sudden change of nature which such introduction would bring about. The fallacy as to new causes involving any breach of continuity, or any sudden or abrupt change in the effects, has already been shown; but we will further point out that there are at least three stages in the development of the organic world when some new cause or power must necessarily have come into action. The first stage is the change from inorganic to organic, when the earliest vegetable cell, or the living protoplasm out of which it arose, first appeared. This is often imputed to a mere increase of complexity of chemical compounds; but increase of complexity, with consequent instability, even if we admit that it may have produced protoplasm as a chemical compound, could certainly not have produced living protoplasm—protoplasm which has the power of growth and of reproduction, and of that continuous process of development which has resulted in the marvellous variety and complex organization of the whole vegetable kingdom. There is in all this something quite beyond and apart from chemical changes, however complex; and it has been well said that the first vegetable cell was a new thing in the world, possessing altogether new powers—that of extracting and fixing carbon from the carbon-dioxide of the atmosphere—that of indefinite reproduction, and, still more marvellous, the power of variation and of reproducing those variations till endless complications of structure and varieties of form have been the result. Here, then, we have indications of a new power at work, which we may term vitality, since it gives to certain forms of matter all those characters and properties which constitute life.

The next stage is still more marvellous, still more completely beyond all possibility of explanation by matter, its laws and forces. It is the introduction of sensation or consciousness, constituting the fundamental distinction between the animal and vegetable kingdoms. Here all idea of mere complication of structure producing the result is out of the question. We feel it to be altogether preposterous to assume that at a certain stage of complexity of atomic constitution, and as a necessary result of that complexity alone, an *ego* should start into existence—a thing that feels, that is conscious of its own existence.* Here we have the certainty that something new has arisen—a being whose nascent consciousness has gone on increasing in power and definiteness till it has culminated in the higher animals. No verbal explanation, or attempt at explanation, such as the statement that life is the result of the molecular forces of the protoplasm, or that the whole existing organic universe from the *amœba* up to man was latent in the fire-mist from which the solar system was developed, can afford any mental satisfaction, or help us in any way to a solution of the mystery.

The third stage is, as we have seen, the existence in man of a number of his most characteristic and noblest faculties—those which raise

*No doubt all that Mr. Wallace here really means is that we have distinguished as consentience.

him further above the brutes, and open up possibilities of almost indefinite advancement, when faculties could not possibly have been developed by reason of the same laws which have determined the progressive development of the organic world in general and also of man's physical organism.

These three distinct stages of progress from the inorganic world of matter and motion up to man point clearly to an unseen universe—to a world of spirit, to which the world of matter is altogether subordinate. To this spiritual * world we may refer the marvellously complex forces which we know as gravitation, cohesion, chemical force, radiant force and electricity, without which the material universe could not exist for a moment in its present form, and perhaps not at all, since without these forces, and perhaps others which may be termed atomic, it is doubtful whether matter † itself could have any existence. And still more surely can we refer to it those progressive manifestations of life in the vegetable, the animal, and man—which we may classify as unconscious, conscious, and intellectual life—and which probably depend upon different degrees of spiritual influx. I have already shown that this involves no necessary infraction of the law of continuity in physical or mental evolution, whence it follows that any difficulty we may find in discriminating the inorganic from the organic, the lower vegetable from the lower animal organisms, or the higher animals from the lowest types of man, has no bearing at all upon the question. This is to be decided by showing that a change in essential nature (due, probably, to causes of a higher order than those of the material universe) took place at the several stages of progress which I have indicated—a change which may be none the less real because absolutely imperceptible at its point of origin, as is the change that takes place in the curve in which a body is moving when the application of some new force causes the curve to be slightly altered.

We cordially commend the above passages from Mr. Wallace's book to the careful consideration of our readers. Its author does not, of course, employ the terms of Catholic philosophy, with which he is unacquainted. But, with a few changes of terminology (of which we have suggested one or two), it seems to us to accord marvellously therewith.

Very interesting is it to us to note the substantial harmony which exists between the views here put forward, and those for which we have combated these eighteen years, and which we have recently proclaimed afresh (see "On Truth," p. 419), when we said:—"Science shows us a world, consisting of a number of separate inorganic substances, each being a substance of some definite kind, with special power and properties. It also tells us that each is an actual material substance, informed by an

* Here probably the term "immaterial" would satisfy Mr. Wallace's requirements.

† Here *materia prima* is evidently not what is referred to.

immaterial energy which is utterly unimaginable and inscrutable in its nature. Each material object is thus regarded as a unity having its material and its immaterial side—a *composition* of matter and of some form of energy, the both principles giving the substance those powers and properties which make it what it is."

Therein we also urged what we have so lately re-asserted* that all analogy is in favour of the existence of a separate immaterial, dynamic principle of individualism, or soul, in every physically distinct living being, and that the existence of the human soul is "the primary and highest truth of physical science."

Such is emphatically the belief of that very estimable and most accomplished naturalist—the author of the misnamed work we are reviewing; for it is assuredly one of the most anti-Darwinian publications which has appeared for a long time. He boldly and unequivocally declares (p. 477) that, to him, "the whole purpose, the only *raison d'être* of the world—with all its complexities of physical structure, with its grand geological progress, the slow evolution of the vegetable and animal kingdoms, and the ultimate appearance of man—was the development of the human spirit in association with the human body." This is a declaration, in other words, of what we almost simultaneously declared ("On Truth," p. 495):—"A successively increasing purpose runs through the irrational creation up to man. All the lower creatures have ministered to him, and have, as a fact, prepared the way for his existence. Therefore, whatever ends they also serve, they exist especially for him." No doubt, Mr. Wallace would also further, and fully agree with us, that the true end of the world's existence was "the fulfilment of the moral law—a fulfilment to be brought about after what seems an eternity to the imagination, but which reason cannot doubt to have been in its due time and season."

With the exceptions herein drawn out, we must conclude by expressing our admiration for, and our warm approval of, Mr. Alfred Wallace's work, which contains, so far as we have seen, nothing, from cover to cover, which is inconsistent or irreconcilable with a faithful adherence to the teaching of Catholic theology.

ST. GEORGE MIVART.

* "Dublin Review," October, 1889, p. 275, 276.