

DARWINISM.

WHEN Darwin published his great work on the *Origin of Species by Natural Selection*, the title of the volume was quickly felt to give no adequate idea of the nature of the subject. For when "Species" comes to be defined it is found to have no meaning more definite than that of general likeness with particular differences, and as this in various degrees represents the relation of every living thing to every other the inquiry appeared to be within the limits of no boundary line and to involve no single issue. It was, indeed, nothing less than a general inquiry into the causes of likeness and difference in organic life. But we ourselves are organized beings, distinguishable among the rest only by likeness and difference. Our own life history is a part, and in a transcendent degree the most interesting part, of the whole inquiry, and the rapid perception of this fact very quickly changed the meaning of the *Origin of Species* into the *Origin of Man*. Hence arose the fierce and bitter controversies of the early days of Darwinism, for everything that good men value most either was or seemed to be at stake. The debate is in no sense ended, or likely to be, but its heat is modified; the points at issue have been made clear, and a calm examination of the whole subject has become possible to most of us. No better help in this direction could have been given either to the scientific world or the general public than is to be found in Mr. Alfred Wallace's recent work on *Darwinism*.

Those who differ most widely from Mr. Wallace's views cannot fail to see that he has given in a clear and most interesting form and in the strict spirit of a simple inquiry after truth, a plain statement of the Darwinian doctrine as it stands at present, of the evidence relating to it, of the consequences resulting from it, and of the mode by which he himself reconciles these consequences with the highest hopes of the human race. Mr. Wallace is necessarily the best living expositor of the doctrine of Natural Selection, the central truths of which were discovered independently and simultaneously by Darwin and himself.

Those truths, if separated from the theories that have been built

upon them, are extremely simple, and are established beyond dispute.

All living things, both plants and animals, multiply naturally with such rapidity that if all that are born lived to maturity, earth, air, and water would be quickly filled with them, and the greater number would then die of starvation. Instead of this, vast multitudes are at every instant dying from other causes. They prey upon each other, and are swept away by every kind of destructive agency, especially while young. Who, then, are the survivors? Why do some live rather than others?

The answer does not admit of doubt. The survivors are those who, from any cause, have been best fitted to contend against the agents of destruction, and the cause is generally some slight advantage over their fellows, in form or function. These become the parents of the next generations. The offspring are like their parents, very nearly. The characters which have given the parents an advantage are inherited by many of their offspring and tend in like manner to their preservation. Any fresh variation from the parental form which gives a further advantage in the struggle of life again causes its possessors to survive rather than those who are without it, and is again transmitted by inheritance. And the tendency to slight variations is constant and universal.

This is the whole doctrine of Natural Selection by the survival of the fittest; the "fittest" being simply those who are best able to defend themselves in the struggle for existence. Nothing could be more complete than Mr. Wallace's description of the whole natural process as it goes on perpetually around us, and nothing can be more certain than that inherited changes of form and function are necessarily and constantly produced in this way. We may go further and say that those differences among living things, otherwise alike, which we commonly call differences of species, are without doubt generally accounted for by this process, and have generally resulted from it.

This is Darwin's real discovery. We recognize in it one of the great laws to which living things are subject. It explains what no theory of creation had explained before, the constant changes in the forms of life revealed to us by the study of geology. We see that these forms must necessarily change; that the descendants of any living thing, after a hundred or a thousand or a million generations, must acquire permanent characters by which they differ more or less from their ancestors. So far it is solid ground. Here, however, we come upon the crucial question of all further inquiry. To what extent can they differ? What are the limits of possible change?

It is in the answer given to this question that the whole antagonism between the religious spirit and the Darwinian theory arises. Darwin himself left it finally an open question, but his more ardent followers of the purely materialistic school have answered it definitely in a way which appears wholly to destroy the foundations of religious trust, and the hope of human immortality. Mr. Wallace accepts this answer, but not its apparent consequences, and offers in his final chapter an interpretation of the facts, which is essentially the religious one. It has its own difficulties, and will be rejected at once by confirmed materialists, but it comes with refreshing force at the present stage of the controversy as a denial of the supposed irreligious results of Darwinism by one of its founders.

But the materialistic theory as to the limits of possible change contains in itself grave difficulties to which very slight attention is paid by its advocates. There are many stages in this theory in the minds of men, depending on the degree of thoroughness with which it is probed to the bottom, but only one form of it is logically defensible. The fact of limitation is never doubted. It is not believed that a sheep could be the ancestor of a lizard, or a cow of a bee. What is believed is that the very simplest form of life; a single undeveloped cell of living matter; has been capable of reproducing other cells like itself, but in which indefinite variations of form were possible. Each variation, when it occurred, determined the direction of further change in future generations. Such a cell is supposed to have existed once when no other living thing existed. Such variations are supposed to have arisen in its immediate descendants, and it is assumed that the lines of future change determined by them constitute the typical forms from which, under the influence of natural selection, all the groups or families of living things were gradually developed. And it is assumed that form and function develop together.

The question is whether such a cell has ever existed, or been able to exist, and the fundamental objection to the theory is that it rests upon an assumed fact for which there is no authority. We know nothing of any possible form of life unless it has been seen, either alive or as a fossil. Our knowledge of a single cell as what we suppose to be the simplest form of life is derived solely from observation, and no such cell as is here supposed has ever been seen. Every cell known to us is the product of some living parent and of nothing else, and what a cell would really be if it had, or could have, any other origin, we have no power even to conceive; for what we call a simple cell is, in fact, as elaborate and complex a structure, with as definite a power of reproduction in one direc-

tion only, as anything known to us. We do not know this from observation of its structure, for this is entirely hidden from us; but we do know it from observation of its results. Cells that to our senses are absolutely simple, perfectly structureless and indistinguishable from each other, are abundant enough; they are the actual germs of every living thing. But what they seem to us is determined by our own powers of sight, and not by their true structure. Two white spots on a distant hill appear both alike; to us, at our distance, they are white spots only; while, in fact, one is a block of stone, and the other a sheep, and there is no single point of resemblance except their colour. Exactly so the supposed simplicity of a living germ is not a fact of nature, but only the expression of our own blindness. The germ of life in a robin's egg cannot be distinguished from a sparrow's, but the sparrow's egg can no more produce a robin than a sheep can become a stone, or a stone a sheep. To think of these germs as mere cells of protoplasm, meaning by protoplasm a substance uniform in structure and character, is to deceive ourselves. If such a substance exists at all, it does not constitute the whole of any living germ, and is not the determining element in its history.

To suppose that the origin of all living things was a living cell, when we know no living cell except as the product of a living thing, is to build a house without a foundation, and to account for this primeval ancestor has been the effort of the materialistic school. It might, of course, be accounted for as the direct product of creative power, but materialism rejects this everywhere, and theology knows no reason for its interference in this particular form. The Nebular Theories to account for the earth itself, and the theory of atomic energies transforming themselves into vital powers, are the props by which it is sought to hold up the vast hypothesis. But they are fundamentally unsound. If the attributes of life or their known constituents were found in material atoms; if oxygen, hydrogen, carbon, or nitrogen, or any mixture of them not brought about by vital power, gave any evidence of vital power, the theory might at once be tenable; but this is precisely what all our knowledge persistently denies. We can make out of inanimate matter things also made by vital processes, but the things we thus make are not alive. Whatever may be the essence of life, we cannot find it anywhere in the inanimate world. The production of a single living cell without a living parent is as impossible by any natural causes known to us, as the production out of nothing of a perfect universe filled with perfected forms of life. The events would differ in size only: in character not at all.

But putting aside this question of the origin of life, it is supposed

that the record of geology shows in fact that there was a period when none of the higher forms of life existed; that they have appeared on the earth in a gradually ascending series from age to age, and therefore that we have before us only two alternatives: either the higher forms are descended from the lower, or successive acts of creation have produced them.

This would be sound reasoning if the geological record were really what it is here assumed to be. The fossils that have been found in the oldest rocks are only of what we call low forms of life; fossils of the highest forms have only been found in recent strata, and the intermediate series corresponds with the theory to a certain extent and in a general way. But this is no record of the creatures that have lived upon the earth, or of those that have died there. It is a record only of those that have been buried in a very special way. With very few exceptions no living forms can become fossils at all unless they are buried under water, and none are preserved as fossils through long geological periods unless they are buried either in deep water or in deposits that sink to a considerable depth soon after they are formed. Of the myriads that die hourly only an infinitesimal proportion are ever buried in any way. Nearly all the higher forms of life die on land, where they decompose and vanish. It is only by rare accidents that any of them are buried under water before this occurs, and to be so buried, under the conditions necessary to convert them into fossils, in beds that will lie undisturbed till they harden into rock, is again the accident of an accident. All stratified rocks, in which alone fossils can be found, are rocks that have sunk to a considerable depth in the earth's crust if they are of great antiquity. Deposits that remain near the surface, being constantly disturbed by superficial agencies, are never able to grow old.

Thus, it follows that of all the fossils of every age a prodigious majority are of creatures that live and, therefore, die in the water. Their chance of the necessary burial and preservation is almost infinitely greater than with the inhabitants of the land, and is again enormously increased by the fact that shells with which so many of them are covered are among the most durable products of the animal kingdom. The only spots where land animals in general are likely to be fossilized are lakes, or the estuaries of rivers into which some of their bodies are washed, or the places where sudden floods overwhelm them and bury them at once in mud; and of these spots, which never make more than a minute portion of the area of the globe, it is only those that are in subsiding areas that can ever produce ancient rocks with these fossils preserved in them.

It follows necessarily that fossils of the higher forms of life instead of being, like shells, generally diffused and common to most strata, exist only in small scattered portions of the earth's crust, and that as destructive agencies are in perpetual action, the chance of finding any one of them continually decreases as we go back in geological time.

On what ground, therefore, is geology supposed to tell us that the lower forms of life existed before the higher forms? If we have found no fossil of the higher forms in the older strata, does that prove that these forms had not come into being when those strata were deposited? It not only does not prove this; it is not even evidence on the subject; it leaves us ignorant, but that is all. That this is absolutely true is demonstrated at once by the well-known facts concerning the mammalia. We know that they were abundant through the Tertiary period, while through the whole Cretaceous period immediately preceding it we know nothing whatever about them from any fossil remains. Yet we also know that they existed through that long age because a few mammalian fossils have by chance been found in rocks of the age before it. Nothing could show more clearly the utter worthlessness of negative evidence concerning their existence in any geological period. What happened in the Cretaceous age, which is comparatively recent, is still more likely to have happened at every step backwards in time. Mammalian fossils were undoubtedly formed in the great series of strata between the Oolite and the Eocene, and some of them may any day be found. But the accident of their discovery has not happened yet, and may never happen, in these or any other strata where they may exist all the same.

The real truth concerning the geological record is this: Supposing the world to have been filled with every typical form of life as it is at present, from the earliest ages, there is no reason to expect a different record in the rocks. None of the creatures living in ancient times would be exactly like their present descendants. General resemblance would be accompanied by continual change in detail. Natural selection would have determined the predominant forms in every age. These would constitute the predominant fossils where fossils were preserved, and whenever this predominance was due to continuous change in any special direction, we should find this fact represented if these fossils were found.

But the higher forms would be rare always; rarest in the oldest strata, and comparatively abundant only in recent rocks. They would never be found except by happy accident, while shells

and other marine forms would generally be discovered because they are generally distributed wherever the burial of living forms under water is able to occur. This is only to describe in general terms the actual geological record.

Mr. Wallace is fully aware of this, and with characteristic candour he admits the "possibilities of a world of terrestrial life in the remotest Palæozoic times."*

But the consequences flowing from this are of the most far-reaching kind. What do we really mean by "higher" and "lower" in the scale of life? Leaving human beings out of the question, all other animals appear to be essentially alike. They all use the same powers for the same purposes. Their lives are spent in feeding, rest, activity, reproduction, and association with their kind. These are all sources of enjoyment to them, and animal life never consists of much more or much less than they include. Which then among their varied forms is "higher" than another? Unless we can measure degrees of enjoyment—which is impossible—it would seem that any form of life by which it is obtained in this way should be as "high" as any other. That the forms must be different is obvious if the whole world is to be filled. Creatures that are to live the life of infusoria must be very small. Those that live as lions and tigers do must be large and very different in structure. Those that fly in the air must be very light. Those that live in water must need neither much warmth nor much oxygen. Immense variety is thus required, and it is so fully provided for that wherever life of any kind is possible, it is abundantly found. The word "highest" seems appropriate only and equally to any form that is best fitted to live in any one of the possible ways.

Natural selection secures the existence of such forms in preference to others, and the forms thus selected change as the conditions of life do; and as these are perpetually changing there is perpetual change of form. But the difference of form makes no difference in the essential character of living animals. They all in different ways are doing the same thing with the same object, which is the simple enjoyment of sentient life.

In what sense is a sheep higher than an ant in the scale of life? All the usual sources of animal enjoyment are common to both, while the ant has powers of building and apparent forethought, which the sheep does not possess. The fact is of the very highest interest in any theory as to the origin of man, because it entirely subverts the idea that a mammalian brain is in any way necessary to the display of mental powers so far as they are possessed by the

* *Darwinism*, p. 405.

lower animals ; and if in fact the human mind had been developed through animals of the mammalian form it would be a sound inference to suppose that beings with equal mental endowments might be developed through any other form. An ant has no brain and yet is the mental equal of any other animal, man alone excepted. No particular bodily form can in reality be identified as the essential organ of mental powers, and we are at once relieved from the idea that human intelligence cannot have existed on the earth till human beings were found upon it in shapes exactly like our own.

The whole conception of animal life as existing in an ascending series from low to high is true only in a conventional sense, and with reference to our own feelings of sympathy and powers of observation. The far higher truth is that living creatures, who, as living creatures, are essentially alike, exist in every variety of form in which life can be enjoyed in earth, air, or water, and that man is not the culminating point of any series but a being who stands alone, possessing all the living powers which all living things possess in common, but with something added by which powers and objects of another kind result in life of another order.

Mr. Wallace admits this concerning the human mind though not concerning the human body. He is absolutely Darwinian in believing that the latter has been derived by gradual development from the lower animals. The only alternative, he argues, is the supposition that man has been produced in some quite different way from other animals, while we seek in vain in our physical structure for any indication of an independent origin. But this is surely a misconception of the case. The true alternative is a confession of ignorance ; not an assertion of knowledge. We seek in vain for the "origin" of life in any form. Our utmost knowledge of the past reaches to no period when the earth was not full of it, and gives us no hint whatever of how it came there. Every type of life existing now has had an ancestry essentially like itself for an indefinite length of time, and the constant putting back of the period at which the existence of such an ancestry first becomes certain is one of the commonplaces of geological research. We have no knowledge and no real ground for any opinion as to the date of the first appearance of any of these ancestral lines, except the constantly increasing probability that it was, in every case, before the formation of any rocks now known to us. Mr. Wallace in effect admits this in many passages of great interest, and in the final explanation which he offers concerning the origin of the human mind he recognizes a cause sufficient to account for all phenomena not otherwise explained. He believes in the existence

of a spiritual world associated with and acting on the material world, and finds in this the source of those mental characters in man himself which the Darwinian theory is unable to account for.

This of course is essentially the belief of every Theist, whatever may be the form of his religious views. Mr. Wallace holds opinions not generally accepted as to the degree and method of communication between matter and spirit in the present world, but they do not enter into his argument or affect its force. Darwinism, as he understands it, instead of excluding spiritual agencies in nature, is incomplete and inconclusive without them. It is this final view which gives so deep an interest to this important volume.

That there are at least two kinds of existence, and not one alone, is the belief to which the profoundest thinkers of the world have invariably been led when the cold shadow of materialism has not obscured the brighter vision, and that shadow only falls where the pursuit of knowledge through the medium of the senses appears to blind men to the fact of knowledge which the senses cannot give. But we think and feel, and can no more express what we mean by thought and feeling, in any terms descriptive of any state of matter, than we can describe a colour by the flight of time. And we know that our fellow-creatures think and feel, as surely as we know anything out of our own consciousness, though no bodily sense of ours ever perceived, or could perceive, their feelings or their thoughts.

The semi-materialist, who believes that nothing exists except material atoms and the energy whose only function is to make them move, and the strict materialist, who sees in the word energy only another name for motion, alike present us with a universe of passing shadows, where the qualities by which men differ from the brutes have no real value and the hopes those qualities inspire have no foundation. Not so the nobler and profounder science which recognizes the existence of things not made of matter as well as material things, and sees that it is not in the motion of material atoms but in the relation between those atoms and the spiritual world that the true cause of life is to be found.

But if geology fails to show that the lower forms of life existed before the higher ones, the development of the latter from the former is still supposed to be demonstrated by the study of embryology. All animals alike grow to maturity from a microscopic germ, and in doing this they pass through a series of changes in which the growing embryo becomes more or less like a succession of living forms. But though this is true, the idea that these must represent the successive forms of its ancestral

parentage is an immense assumption, the more astonishing because there is a simple and natural reason for the general fact.

When a builder lays his first brick in the ground there is nothing in it to show what he means to build. He goes on laying brick after brick, and by degrees a structure begins to rise. At first it is the beginning of a wall, then of an enclosure, then of other walls and other enclosures, then of floorings, stairs, upper rooms. But the earlier stages are the same, whether the building is to be a shed or a temple, and the forms it takes are the successive forms of a whole series of buildings. Scaffoldings, too, are raised which serve their purpose and are then removed. Props, tools, machinery, come and go in the process.

This is exactly the way in which an embryo grows. It is a process of building, the creation of a structure bit by bit, by additions from without. And as all living creatures, like houses and churches, are made in general accordance with one or other of a few typical plans, the more complex necessarily resemble the less complex in their successive shapes. The minute details of change, and the appearance of what we call rudimentary and useless organs, are doubtless curious in themselves, but we must know a great deal more about the reason why embryos grow at all before we are in any condition to determine the real meaning of a rudiment, or to say that any organ is useless because we cannot see the purpose it serves.

But the embryonic theory must be rejected as radically unsound for another reason. There is no real resemblance or analogy between the growth of an embryo and the history of its ancestry. Admitting Darwinism to the full, the ancestral line has gone through its series of changes by natural selection in the struggle of life. The changes in the embryo on the contrary are pre-determined by its immediate parentage. There is no struggle and no selection. The embryo grows in such a way as will produce a creature like its parent, not in such a way as could produce creatures unlike its parent, as its ancestors are supposed to have been.

But finally a general support to the materialistic theory of man's origin has been found in the supposed indications of a former period, when all living men were savages. But here, as in the geological record, a positive theory is built upon nothing but negative evidence.

No remains of the works of civilized men have been found nearly so old as some of the flint implements, which were, no doubt, the tools of savages. But flint implements are almost indestructible by time, and are preserved for ages like shells when they happen

to be buried, while the works of civilization, like the bodies of terrestrial animals, for the most part perish rapidly. The flint implements prove that savages existed long ago, but they tell us nothing about any other inhabitants of the earth; and as there have been savages in great numbers side by side with civilized nations from the first dawn of history, there is nothing to show that this was not also the case when the flints were fashioned by their hands. There are, on the other hand, many cogent reasons for believing that it must have been so; first, from the extreme improbability that mankind at large, if gifted with the power of civilizing itself, could remain everywhere in the savage state for an indefinite time; and, secondly, because among the savage races known to us now it is certain in almost every case that they have been preceded by races at least more civilized than themselves. Real knowledge as to the past history of mankind begins only a few thousand years ago, and relates to civilized, not savage, races. We are in total ignorance about their predecessors, but the researches of our own day have constantly brought to light the evidence of higher culture in ancient times than was even suspected a century ago, and have shown conclusively how easy it is for the greatest nations to pass away and be utterly forgotten. The subject is far too wide for discussion here; but the chief causes are to be found in the highly perishable nature of most human works, in the changing areas of social progress or decay, and in that constant loss of interest in events very remote from our own time which leads quickly to the loss of records, and soon buries them in oblivion.

Archæological research is not one of the primary pursuits of men, and when it ceases to be active for any considerable period the outlines of the distant past vanish irrecoverably.

One of Mr. Wallace's pleasantest chapters is that in which he disposes of the morbid idea that the struggle for existence renders the life of the lower animals one vast scene of cruelty and pain. The utter fallacy of this conception of nature is demonstrated in a few admirable pages of convincing proof.* The life of each individual is one of almost unmixed enjoyment, and no question arises in which there is any greater difficulty than the unsolved mystery of the existence of evil in any form.

It may be hoped that Mr. Wallace's book will give a broader and sounder spirit to the Darwinism of the future. The reconciliation between it and the religious hopes of men is impossible to a materialist, but not so to those who have escaped from that abyss of gloom. With them what is chiefly needed is the frank confession

* *Darwinism: the Ethical Aspect of the Struggle for Existence*, pp. 36-40.

that as to life in general we know nothing whatever about the time, the method, or the form of its first appearance in the world; that the fact of continuous variation in living forms is certain, but that its limitations are quite unknown, and that whatever man's origin may have been, there is that in the human soul which no reasonable theory can derive from the lower animals; which proceeds from another source, and confers on him another destiny. We do not know how it has been received; but there is an eternal difference between the hopes associated with life regarded as the product of the clash of atoms, ceasing when they separate, and life the attribute of a living spirit, subject, indeed, to material conditions, but not subject to decay.

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