

## PRESENT STATE OF THE EVOLUTION QUESTION.

WALLACE AND WEISMANN.

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THAT there is such a process as Evolution, whatever that may be, is now settled among naturalists. There is not a scientist under thirty years of age who does not believe in it in some form. Our theologians and religious journalists, who are ignorant of natural history, speak against it less frequently and dogmatically, tho they still claim a petty victory when evolutionists quarrel about some subordinate points. Meanwhile the question agitated is, Admitting Evolution to exist, what are its precise nature and its limits? At this moment this cannot be regarded as settled. The process is still a mystery. Vigorous attempts are being made to clear it up, with the prospect in the course of years of succeeding at least so far.

We have two important works recently published treating of this subject in a scientific manner. There is "Darwinism, an Exposition of The Theory of Natural Selection with some of its Applications." This is by Alfred Russel Wallace, the co-discoverer with Darwin of the theory of Evolution. We have also an English translation by Professor Meldola of the scattered papers of Weismann, who has been profoundly searching into the nature of Heredity.

It is clear that Evolution is not a simple force or law of Nature, such as gravitation and chemical affinity. It is a process involving several elements. I have called it an *organized causation* embracing a number of powers, the separate nature and co-operation of which it is the office of scientific men to determine. When they have advanced a few stages further, and filled up the gaps which stare us in the face, as we survey their discoveries we hope that natural theology, as it already discovers traces of use and design, may in the end be able to establish a FINAL CAUSE running through Evolution, seen not only in the structure of plants and animals, but in the mode of their production in the ages. We shall then have a successive teleology running through time as we have had for ages a contemporaneous teleology extending through space.

Dr. Wallace's work is the most important exposition of Evolution which has appeared since Darwin's original work on "The Origin of Species." In the early editions of that work Darwin accounted for development by Natural Selection. At a later date, in consequence of difficulties started and new theories propounded, he allowed a place to other agencies such as environment, use and disuse; made, with his usual candor, admissions to his critics and apparently abandoned, to some extent, his theory of Natural Selection as the exclusive or main potency in evolution. Now we have Wallace bringing us back to the original principle of Darwin, maintaining that "Natural Selection" with the "Survival of the Fittest" is, after all, the universal and main power in Evolution, giving a fuller account of this principle than has ever been done before, and defending his position by innumerable fresh illustrations. He has succeeded in showing that Natural Selection works everywhere in Nature, and works as a controlling and guiding power over other powers also working. But Evolution is a complex process, an organized co-operation of causes working to one end, and there are other agents besides selection; and natural science is seeking to discover them and explain their nature and mode of operation, and natural theology may show what the profound Leibnitz found everywhere in Nature, *causes working for ends*.

It has been objected to Darwin's exposition of his theory that he dwelt mainly on the variations made on cultivated plants and domestic animals. Thus he shows that all pigeons, of which one hundred and fifty variations can be distinguished, are derived from the slaty-blue rock, pigeon. Wallace takes up the native species and illus-

Dr. Wallace explains the process:

"The theory of Natural Selection rests on two main classes of facts which apply to all organized beings without exception, and which thus take rank as fundamental principles or laws. The first is the power of rapid multiplication in a geometrical progression; the second, that the offspring always vary slightly from the parents, tho generally very closely resembling them. From the first fact or law there follows necessarily a constant struggle for existence, because while the offspring always exceed the parents in numbers, generally to an enormous extent, yet the total number of living organisms in the world does not and cannot increase year by year. . . . Of the whole annual increase of plants and animals only a small fraction survives. In the long run those survive which are best fitted by their perfect organization to escape the dangers that surround them. . . . Consequently every year on the average as many die as are born, plants as well as animals, and the majority by premature deaths. They kill each other in a thousand different ways; they starve each other by some consuming food that others want, and they are destroyed largely by cold and heat, by rain and storm, by flood and fire. There is thus a perpetual struggle among them which shall live and which shall die, and this struggle is tremendously severe, because so few can possibly remain alive—one in five, one in ten, often only one in a hundred, or even one in a thousand."

We are inclined to ask here, What need of so much death? I am not sure that I can give a complete answer to this question and clear up thoroughly the subject of the existence of pain under the government of a beneficent God. Still I can point to light reflected from the cloud. It is clearly the good purpose of God that the race should continue and not the individual. Dr. Wallace tells us that "illness, and what answers to poverty in animals, continued hunger, are quickly followed by unanticipated and almost painless extinction. The fights of wild beasts seem to us intolerably cruel, but it is ascertained that in the contest there is a nervous tension which prevents any pain from being felt." I am not sure that this altogether removes the difficulty, for we have all seen diseased and wounded animals exposed to torture for a considerable period. But this mystery of evil does not press with greater hardness upon the evolution than on the anti-evolution theory. Death is so awful to man because after it cometh the judgment—"the sting of death is sin and the strength of sin is the law." And from sin and the law both the lion which tears and the lamb which is torn are free. It is pleasant to discover that the doctrine of Evolution shows more fully to man than ever he had known before what infinite pains God has taken to continue the species both of plant and animal, to promote the comfort of the animal and enable it to realize its full capacity.

This is done very successfully and very beautifully in this work of Dr. Wallace. I intend to present some of the details and take full advantage of them in another paper on Final Cause in Evolution. But before closing this paper I must call attention to Wallace's closing chapter "Darwinism applied to Man."

Dr. Wallace is evidently not master of the nature and laws of man's mind as he is of those of the plant and animal kingdoms. But knowing well the precise nature of Evolution he has the sagacity to discover, and the courage to maintain, that in accounting for the forms and colors and structure of vegetables and animals it is not competent to explain the phenomena of men's intellectual and moral nature. Every one who has studied these has felt when Darwin comes to treat of them the giant has lost his strength. Wallace takes up the psychical subjects with which he is acquainted. He treats of the mathematical, the musical and artistic faculties and shows conclusively that the Darwinian theory does not admit of an application to them.

"It must be remembered that 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 must therefore recall the essential features of that theory. These are the preservation of useful varieties in the struggle of life, that no crea-

trates Natural Selection by numerous and varied illustrations from all parts of the vegetable and animal kingdoms and from widely scattered countries.

He begins with showing that all plants and animals, and all their organs are liable to vary in their descent. "Every one knows that in each litter of kittens or of puppies no two are alike." Of the higher tribes of animals each newly-born one has its own physiognomy. The variability is a general character of all common and wide-spread species of animals and plants, and it extends to every part and organ, whether in the shape or the internal structure. "It usually reaches from ten to twenty and sometimes even to twenty-five per cent. of the average size of the varying part." We may observe these variations in plants with which we are all familiar. Of the bramble forty-five species have been described; of willows (*Salix*), forty-one species; of hawkweed (*Hieracium*), thirty-two. Wallace shows that these numerous variations are sufficient to furnish abundant material for Natural Selection, and the survival of the useful, and the disappearance of the useless. Perhaps the phrase "Natural Selection" is somewhat misleading, as it seems to imply some discernment and choice on the part of the animal or plant of which there is certainly nothing, while there may be purpose on the part of Him who made them, and disposed and distributed them.

ture 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 therefore to ask, what relation the successive stages of improvement of the mathematical faculty had to the life and death of its predecessors; to the struggle of tribe with tribe, or nation with nation, or the ultimate survival of one race and the extinction of another. If it cannot possibly have any such effects, then it cannot have been produced by Natural Selection. It is evident that in the struggles of savage man with the elements and with wild beasts, or of tribe with tribe, this faculty can have had no influence.

"As with the mathematical so with the musical faculty it is impossible to trace any connection between its possession and the survival of the fittest in the struggle for existence."

A like remark is made as to the artistic faculty.

"And besides the three which have been specially referred to there are others which evidently belong to the same class, such as the metaphysical faculty" as also "the peculiar faculty of wit and humor."

I may add that there are other and higher powers and ideas (which Wallace has not noticed) which it would be still more palpably absurd to attribute to the law of Natural Selection; there is the conscience with its perceptions of good and evil, and the felt obligations of morality.

When a new and wonderful law of Nature is discovered

there is a tendency among enthusiastic scientists to extend it beyond its legitimate province. I am so old as to remember that when Sir Humphrey Davy made his brilliant discovery of the relationship of electric and chemical action every dabbler in science hastened to explain all the action of Nature by electricity. There is a like disposition in the present day to account for all Nature by Evolution, using the phrase in an undefined sense. I am glad to find that one of the two simultaneous discoverers of the law has come forward to show that there are higher parts of man's nature which it cannot possibly explain. The work of the past age has been to show that Evolution is a mighty power in Nature; the work of the present age is to show what it is precisely, to determine what are the various powers involved in the process and the limits to be set to its action.

While Dr. Wallace stands up so resolutely for a power above the material, the conclusion which he reaches as to the nature of that power is altogether unsatisfactory. The higher faculties in man seem to him to point clearly to an "unseen universe, to a world of spirits to which the world of matter is altogether subordinate, and to unconscious, conscious, and intellectual life," "which probably depend upon different degrees of spiritual influx." This seems to rise no higher than the vulgar *spiritualism*, the weaknesses and the deceits of which have so often been exposed.

I argue the existence of a higher power than Evolution on a deeper ground than Dr. Wallace. I found it on the principle so well established and so universally acknowledged in all the physical sciences, since the discovery of the conservation of energy, that *there is nothing in the effect which was not potentially in the cause*. It follows that we cannot evolve an effect from what did not possess, in an undeveloped state, the qualities that are in the effect. We cannot evolve mind from matter, nor life from the lifeless, nor sensation from the insentient, nor intelligence from the unintelligent, nor morality from the non-moral. Following out this principle it looks as if there must have been ever and anon the introduction of new powers, whether naturally or supernaturally we know not, of sensation, life, instruction, intelligence, morality, producing successive epochs like the days of Genesis and the ages of geology. However this may be, it is certain that all this system and adaptation points to more than a vague spiritualism such as Wallace acknowledges; they show us a God above Nature who has such infinite perfections as to account for all that is Nature.

While Dr. Wallace has succeeded in showing that Natural Selection is a main, or the main instrument, in producing Evolution, and that it mixes itself and sways all other agencies, he has not proven that there are no other powers at work. There is environment; the plant and the animal become ampler when they have suitable soil and food, and they shrink when they have insufficient nourishment. Use draws forces toward the evolving process and disuse withdraws them. There is intelligence directing the physical agencies—Sir John Lubbock has shown how it appears in animals very low in the scale of creation. Dr. W. Cook has traced it in ants and spiders. Biologists have work for years, probably for ages in detecting and tracing the separate and varied potencies at work in the process and in showing how they combine to produce the vast results in Nature, especially the derivation of the present from the past and the production of the harmony and consistency of the whole.

position to the common opinion. The offspring of horses whose tail is docked and of animals which had a limb mutilated, have the same organs which their parents originally had. The descent of acquired properties, say of the greyhound or deerhound, is produced by the law of selection and the union of the sexes.

I have no opinion to offer on this question. In due time it will be thoroughly sifted and what truth there is in it (and I believe there is some truth in it) established. But let us acknowledge that the mystery of our being and our birth has not yet been cleared up. In particular little or no light has been thrown on relation of mind and body united in every child born. We have proof of the existence of the body by the senses, and of mind by self-consciousness, but no means of knowing how they stand related. Meanwhile it is satisfactory to find, that Weismann and other biologists are proceeding on the right method and are sure in the end to gain satisfactory results. The science is already so far advanced that we may reverently inquire into the religious aspect of Evolution. In a second article I mean to ask: "Can we discover Final Cause in Evolution?"

PRINCETON, N. J.

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Dr. Weismann, whose papers are before us in two volumes, is seeking to penetrate into the depths of the mystery of Heredity and for this purpose to unfold the physiology of animal generation. We have left little space for considering his numerous observations and experiments, which are illustrated by plates. The truth is these are so technical in their nature that they cannot be discussed except in medical or purely scientific treatises.

Scientific men seem now to have discarded the old idea of a separate life or vital force—which I acknowledge had a very indefinite nature. But they have been compelled to call in a corresponding power which they are seeking to make more explicit. Darwin called in a *pangensis* collecting material from all parts of the body and transmitting it to the new generation. Spencer has *physiological units* which serve the same purpose. And now Weismann stands up for a germ-plasm of a very complicated structure in the animal body.

“ At every new birth a portion of the specific germ-plasm which the parent egg-cell contains is not used up in producing the offspring, but is reserved unchanged to produce the germ-cells of the following generation. Thus the germ-cells so far as regards their essential nature the germ-plasms, are not the product of the body itself (as Darwin held) but are related to one another in the same way as are a series of unicellular organisms derived from one another by a continuous course of simple division. . . . Thus the new germ-cells arise not at all out of the body of the individual but direct from the parent germ-cell.”

This theory is more specific than that of Darwin or Spencer. It is thus that a substance with a generative power “ passes over from one generation to another ” and preserves the continuity of the race.

According to this theory the acquired property of the individual is not inherited. Weismann holds this in op-