

## Darwinism and Neo-Darwinism<sup>1</sup>

The mass of intelligent people interested in the progress of science have either been sorely puzzled or have imbibed the most defective and erroneous notions of what Darwinism really is. To correct these notions, to give a clear and simple exposition of what is the Darwinism of Darwin, is the task which Mr. Wallace has set himself, and which he has accomplished with a success which perhaps no one else could attain. Mr. Wallace's book may be taken as a faithful exposition of what Darwin meant.—*Saturday Review*.

NOW this statement, which is appended by the publisher to the advertisement of Mr. Wallace's new book, implies two things: first, that the Darwinism of Darwin, or, in other words, the view of natural selection presented in the writings of Mr. Darwin, is one consistent theory throughout; and secondly, that Mr. Wallace stands before the world solely in the character of an expositor of the Darwinism of Darwin. This representation is hardly accordant with the facts of the case; for, in the first place, Mr. Wallace has views of *his own*, which are far from being an echo of Mr. Darwin's teaching, and has adopted from Weismann, as probably true, a most important modification of the theory.

On the other hand, if by the Darwinism of Darwin you understand the theory of natural selection expounded by Mr. Darwin, the utterances of this great scientist are found to be so divergent

<sup>1</sup> *Darwinism, an Exposition of the Theory of Natural Selection, with some of its Applications.* By Alfred Russel Wallace. (Macmillan.) *Essays upon Heredity and kindred Biological Problems.* By Dr. August Weismann. (Clarendon Press, Oxford.)

that the only intelligible way of treating them is to formulate them into two theories, or at least two distinct statements. According to the first of these, natural selection is one among possibly many methods of organic evolution. It consists in the strict isolation for breeding purposes of those favourable variations, or in the exclusive breeding of similar favourable variations, which happen to arise in connection with the variations which are incident upon reproduction—variations which are slight in quantity, individual in range, and indefinite in direction. This strict isolation of the best is effected by the destruction of all the rest, through the struggle for existence which results from the large output of life and correspondingly large destruction. Hence the survival of the fittest, and the transmutation of one organic form into another.

This definition is not given in these exact words in the writings of Darwin, but it embodies in one self-consistent statement much of his teaching on the subject of natural selection.

The modifications which have been subsequently made in the theory have arisen, according to Weismann, in the doubts of Mr. Darwin himself; which doubts, if they were gathered together into a definition, would read somewhat as follows:

Without the aid of natural selection, organic evolution can very seldom, if ever, take place.

Natural selection consists in the elimination of the least fit, or in the partial preservation of the most fit, in company with others less fit, the choice being made from among the variations which occur in connection with reproduction—variations which are often considerable in quantity. By the destruction of the unfit, a process similar to that described by Darwin as the unconscious selection of man, the race undergoes that modification which changing conditions require.

If we ask, why it is that such different expositions of the theory have been given, we shall find that the facts of nature have not been found to accord with the logical demands of the theory; or that the concessions which have been made bring difficulties which these various statements seek to remove.

The admission that there are other factors of evolution at work besides natural selection, brings with it the idea of competition between

two rival systems of evolution—one of which, natural selection, is limited by the conditions laid down by the theory, while the other is not so limited. And in an organic world, which by the hypothesis is always undergoing a struggle for existence, there must needs be a competition between rival modes of evolution. The evolution which could only act on variations, slight, individual, and indefinite, would stand no chance against an evolution which could act on variations which were considerable, general, and definite.

Mr. Darwin strove to lessen this competition by representing as all but powerless the other factors of organic evolution, in whose ability to act apart from natural selection he expresses his belief in many other places. He throws around the subject of variation the veil of mystery; he minimises the amount and frequency of these variations; he interprets the supposed results of other factors of evolution as really the outcome of natural selection. All of which inconsistent treatment is due, it would appear, to the attempt to remove the difficulty presented by the idea of a strong competition.

Now there is one way of getting completely rid of all competition with other factors of evolution, and that is to deny that they have any power at all. If it be true that only variations connected with reproduction can be inherited—if it be true that the sole cause of variation in connection with birth is the modification which is invariably connected with reproduction—if it be true that natural selection, acting through the principle of utility, causes *only* the favourable variation to survive, then natural selection need fear no competition with other factors. It reigns supreme as the sole cause of organic evolution. Now this is the opinion held by Dr. Ray Lankester, if I understand him aright. In an abstract of his lecture delivered at the London Institution, February 14, 1889, and reported in *Nature*,<sup>1</sup> February 28, the summary reads thus :

The real difference between Lamarck's and Darwin's theories was then explained. Congenital variation is an admitted and demonstrable fact; transmission of congenital variations is also an admitted and demonstrable fact. Change of structure acquired during life—as stated by Lamarck—is also a fact, though very limited. But the transmission of these latter changes to offspring is *not proved experimentally*; all experiment tends to prove that they cannot be transmitted. Semper's book on this subject was cited as a failure in the attempt to prove such transmission.

<sup>1</sup> *Nature*, vol. xxxix. p. 428.

The causes of congenital variations were next discussed, and the 'stirring-up' of the germ-plasma by the process of fertilisation was pointed to as the chief.

The doubt which occurs is due to the exact meaning of the word 'congenital': whether this should be taken to signify variations inevitably and necessarily arising out of the act of reproduction, or whether it points also to other variations which manifest themselves for the first time in connection with reproduction. If the latter is meant, the position is identical with that taken by Professor Weismann, to which reference will presently be made. However this may be, we will venture to consider the force of a theory which defines natural selection as the choice of favourable variations from among variations *necessarily* incidental upon reproduction, and as acting without any interruption from any other source.

It must be confessed that it disposes very satisfactorily of the *competition* of other factors and methods of evolution. But we cannot dispose of a power in nature by simply ignoring its existence.

It seems to me that it would be very difficult to prove that the variations which occur in connection with reproduction are only due to the union of two parents, and are *not* in any way, or to any extent, the result of changed external conditions.

Hitherto variations have been supposed to arise from the action of changed conditions and habits, acting on the individual and reproduced in the offspring. This doctrine is now questioned, but only in order to suggest an external source of some of the variations incident upon birth.

Hence the idea that the sole source of the variations which go to produce evolution is due to the variations necessarily incidental upon the act of reproduction, is neither in accordance with the oldest or the newest view of the subject.

Another way of getting over the difficulty presented by the competition of other factors is that adopted by Mr. Wallace.

1. He asserts that variations incident on reproduction may be considerable in quantity, definite in direction, and occurring in many individuals of the same generation.

2. He contends that natural selection will act on these so as to triumph over other variations brought about by other factors of organic evolution, supposing, for the sake of argument, such factors to be in any way operative.

If it be urged that the effects of use would modify all the individuals of a species, while the fortuitous variations to the amount named only apply to a portion of them, it may be replied, that that portion is sufficiently large to afford ample materials for selection, since it often equals the numbers that can annually survive ; while the recurrence in each successive generation of a like amount of variation would render possible such a rapid adjustment to new conditions that the effects of use or disuse would be as nothing in comparison. It follows that, even admitting the modifying effects of the environment, and that such modifications are inherited, they would yet be entirely swamped by the greater effects of fortuitous variation, and the far more rapid cumulative results of the selection of such variations.<sup>1</sup>

It is difficult to understand the cogency of this argument. For in nature, use and disuse imply the self-adaptation of the animal to its conditions, so far as its *habits* are concerned. As these habits are presumably essential to the welfare of the race, all the individuals adopt them or are instructed in them ; and if these habits produce effects on the constitution and organism of the individual, and *if* these effects are inherited by the offspring (which Mr. Wallace here assumes for the sake of argument), then *all* the individuals are being trained in the same habits, are being transmuted into the same form—in a direction which is eminently useful to the race. Now, here a useful modification may clearly be inherited and fixed in the race, without any natural selection at all ; but if natural selection be applied, and, as we will suppose for the sake of argument, with the utmost strictness, all it could do would be to select the very best out of the mass, all of which were good. Now, see what follows in the case of the birth variations, even if we allow with Mr. Wallace that they are considerable in quantity, and are possessed by many individuals in the same generation. In that case it is *possible*, first, that natural selection should not be required, for animals so differently constituted *might* segregate themselves and intermarry. But putting that on one side, we must remember that this way of looking at birth variations raises the quantity, and extends the area of unuseful variations as well as of useful. And these unuseful variations must be put forth in order that the useful variations may arise, if the favourable variations arise fortuitously. Moreover, these

<sup>1</sup> *Darwinism*, Wallace, p. 436.

fortuitous variations do not necessarily contain the exact variation which are favourable in large numbers in every generation, whereas in respect to the inherited effect of use, if it exist at all, it exists in all.

Another attempt to lessen the effect of competition with other possible factors is to be found in the theory of Professor Weismann, who denies that changed conditions can act on the 'body' of the individual, and through the body on the offspring, but yet asserts that changed conditions can effect modifications on the germ-plasm, i.e. on the living stuff out of which the reproductive cells are made. But the position is not greatly altered by this theory. We know, without its aid, that changed conditions do not always act at once; but there is nothing in the theory to forbid that the grandson should show the effect of the changed conditions acting through the germ-plasm, though no such influence is observed in the son. Now, the main point to be noted is that *when* such variation takes place, similar organisms are modified in a similar way by similar conditions, which is a very different kind of variation from that which necessarily accompanies reproduction. Hence, congenital variations may *now* mean two entirely different kinds of modification; but in order to establish the sole action of natural selection, it will be necessary to fall back upon some such argument as that which we have just quoted from Mr. Wallace.

But so far as the theory of natural selection is concerned, it does not matter what causes the congenital variations, so long as their nature is different. Now, the nature of the variations connected with reproduction are very different, if the theory of Weismann be true. On the one hand, no mere theory can blind us to the fact that there are variations *necessarily* incidental to reproduction, arising from the fact that offspring must spring from two different individuals, and that there is the greatest possible difference in the degree in which the offspring may inherit from the parents. In this case we look naturally for individual variation, the nature of which *we* cannot calculate. In such a case the strictest natural selection is necessary. But the case of modifications produced upon the germ-plasm, which are supposed to be the transforming influences which transmute one species into another, is very different. For there the action is similar in effect, if not equal in degree, on *all* subjected to the same process. The influence is clearly definite, and in a useful direction. For if the amount of salt in the water permeating the tissues of the body can reach the germ-plasm and modify it, so that all the descendants subjected to such influence are modified

in a similar way—as in the case of the brine shrimps—you have there a transforming influence which can act without any selection whatever, and which as a mode of evolution must leave far behind the natural selection of favourable variations connected with reproduction only.

It lies outside the scope of the present article to consider recent modifications of the doctrine of evolution, which have had for their effect to enforce the importance and the efficacy of other factors or methods of evolution apart from natural selection. It is enough to say in this place, that these will only enhance the difficulty of the competition in those cases in which natural selection is still supposed to be the chief agent of evolution.

But we will suppose, for the sake of argument, that the sole source of heritable variations is to be found in the variations incident upon the birth of offspring from two parents, and that natural selection chooses out the favourable variations; in that case the 'selection' must be *strict* or it is *useless*; and if the selection is to be strict, there must be no accidental death or very little of it in connection with nature.

Now in the works of Mr. Darwin we find a theoretical assertion of the absolute necessity for the strictness of natural selection, and a frequent admission that there is a great deal of chance in the destruction which takes place in nature.

No reader of Mr. Darwin's works, to say nothing of his life and letters, can doubt that the stricter theory presented difficulties to his mind. The difficulties arose from the impossibility of realising how nature could reproduce the strictest method of artificial selection. The problem which has to be solved by organic evolution is, how to produce a *new type* of organism adapted to the new conditions in the midst of which a species must either live or else disappear from the face of the earth. Artificial selection, ministering in its most artificial form of procedure to the fancy or to the taste of man, afforded an example of what could be done by intelligence and constant interposition. The breeder and the fancier say in effect: 'Grant us only those variations which are incidental to reproduction, albeit they are but slight in quantity, individual in range, and indefinite in direction, and we shall be sure, sooner or later, to get the kind of variation we require; and then, by the principle of the exclusive breeding of similar variants, we will in an incredibly short time produce you the kind of type for which you ask.'

But the strict Darwinism of Darwin does not find in nature a state of things exactly corresponding to that which obtains among breeders and fanciers. It abhors the idea of a constant interposition on the part of any person, however august, and contents itself with maintaining that the order of nature, working automatically, produces results analogous to those produced by the constant interposition of man. The human operator 'isolates for breeding purposes' by physical separation, while the order of nature 'selects' through the agency of death; but when we look for that *strict* selection by death which is expected to produce the 'exclusive breeding of similar variants,' or the isolation for breeding purposes of favoured survivors, by the destruction of all the rest, we do not find such a phenomenon frequently, if ever, present in nature; but always, in each generation, there are many deaths which are dominated by chance.

Mr. Darwin has impressed upon us the fact that most of the destruction in nature takes place in connection with eggs and the young of animals; that much of the death which befalls the adult is accidental—certainly accidental so far as the requirements of the theory are concerned. The busy life of an animal, which preys upon its fellow creatures, does not allow it to be very discriminating, and it cannot reasonably be credited with the desire to secure the survival of the best, and still less to accomplish the elimination of the worst.

Mr. Darwin has also pointed out that one great and chief effect of the enormous output of life is not only, as his theory requires, to afford opportunity for favourable variations to arise, but also to preserve the race from extinction. Now, it follows from this that after a considerable amount of accidental death, if natural selection were ruthlessly applied to the remnant, the race might be so decimated as to be improved off the face of the earth. And hence Mr. Darwin admits the relaxation of the strictness of the isolation, although such relaxation is fatal to his theory. It is interesting to inquire what Neo-Darwinism has to say on this subject.

According to Weismann, a great deal of the destruction which occurs in nature is accidental. Speaking of birds, he says :

Even the eggs of our most powerful native bird of prey, the golden eagle, which all animals fear, and of which the eyrie, perched on a rocky height, is beyond the reach of any enemies, are very frequently destroyed by late frosts or snow in spring, and, at the end of the year in winter, the young birds encounter

the fiercest of foes, viz. hunger. In the majority of birds, the egg, as soon as it is laid, becomes exposed to the attacks of enemies; martens and weasels, cats and owls, buzzards and crows, are all on the look-out for it. At a later period, the same enemies destroy numbers of the helpless young, and in winter many succumb in the struggle against cold and hunger, or to the numerous dangers which attend migration over land and sea, dangers which decimate the young birds.<sup>1</sup>

In birds it (the destruction) begins during the development of the embryo.<sup>2</sup>

It is clear that in such animals as insects we can only speak figuratively of normal death, if we mean by this an end which is not due to accident. In these animals an accidental end is the rule, and is, therefore, strictly speaking, normal.<sup>3</sup>

During the life of animals the destruction of mature individuals plays a most important part, but the existence of the mature plant is fairly well secured; their chief period of destruction is during youth.<sup>4</sup>

Mr. Wallace, in that respect echoing Mr. Darwin, draws the necessary inference from the fact of accidental death in nature, when he says, 'Only a small percentage of the best adapted can be *preserved*;' for it is quite clear that the wholesale slaughter of the young cannot be nicely discriminative.

And yet we find that Mr. Wallace makes other statements scarcely consistent with the above quotation. The survival of the fittest is declared to be a *fact* because the nomenclature of the theory requires that it should be so.

Whatever is really fittest can never be destroyed by natural selection, which is but another name for the survival of the fittest.<sup>5</sup>

This is simply to say that the theory is so worded that it virtually demands a condition of things which does not exist in nature.

Again, he says:

We must get rid of the idea that *chance* determines which shall live and which die. For although in many individual cases death may be due to chance rather than to any inferiority in those which die first, yet we cannot possibly believe that this can be the case on the large scale on which nature works.<sup>6</sup>

Which is in effect to say—We must get rid of the idea that chance

<sup>1</sup> *Essays*, Weismann, p. 12.

<sup>2</sup> *Ibid.* p. 14.

<sup>3</sup> *Ibid.* p. 22.

<sup>4</sup> *Ibid.* pp. 32, 33.

<sup>5</sup> Wallace, *Darwinism*, p. 425.

<sup>6</sup> *Ibid.* p. 122.

determines which shall live and which shall die—not because we have no experience of such a phenomenon as chance in this connection, but because, having experience of it, so far as our observation goes, we must not be led astray by our small knowledge on the subject. We must pull up and state quite distinctly that ‘we cannot possibly believe that this can be the case on the large scale on which nature works.’ In that connection, ‘the fittest will survive.’

But surely this bold supposition that discriminative death takes place on the large scale in all time and throughout all space, while we always see illustrations of accidental death in the actual generations submitted to our observation, is a curious inference when considered as proceeding from a scientific source.

The accidental death which occurs in nature cannot be ignored—cannot be argued away by logic like this. But while we have ample illustrations of the existence of much accidental death in nature, we may ask, on the other hand, whether Darwinism can point to equally clear indications of the *strict* selection which the theory requires. The only approach to such a thing is to be found in the case of Mr. Darwin’s scarlet runners which were subjected to two severe frosts, so that the few survivors were entitled, so far as this particular test is concerned, to be regarded as an illustration of the survival of the fittest. But in connection with this illustrative case, it is admitted that power to resist cold is not necessarily united with other useful variations, nor even with general vigour of constitution.

In this connection it may be interesting to note what proof Mr. Wallace gives of the struggle for existence. His whole chapter on that subject is taken up with showing how one race exterminates another under certain conditions. But it is assuming a great deal to argue that, because one race can exterminate another, therefore the death which works in nature always secures the survival of the fittest among the individuals of the same race. The facts of Mr. Wallace are most important, so far as they lead us to understand the pathetic phenomenon of the extinction of species by internecine strife, but that is a very different thing to the transmutation of species by the discriminative destruction of nature.

But if there is no strict selection in nature, or at least but little, we must not expect to find the isolation of the best by the destruction of

all the rest ; we must not expect to find the exclusive breeding from similar variants.

It is, indeed, conceivable that variants *might* segregate themselves and intermarry. In the case of any great and curious deviation from the normal structure or organism they might do so—they have done so. But that in ordinary cases they should do so, is not in the least probable. Animals are influenced in this respect by blind impulse, or by individual taste, or by romantic love, as truly as human beings are. As for the Darwinian theory of sexual selection, which gives the most numerous harem to the strongest bully, or the most charming female to the strongest male ; well, it does not follow that the beautiful are the most useful in handing down to posterity the variations needful for the evolution of the race, or that the male victorious over all other males is necessarily equally gifted and superior in all other respects. The impression which comes from contemplating the love, courtship, and marriage of animals, is rather that it tends to the preservation of the race than to the formation of a new type.

But if the death which is in nature is not discriminative ; if those who survive are not all the fittest ; if the remnant, being a 'mixed multitude,' intermarry at their own sweet pleasure, then, according to Mr. Darwin, there can be no evolution of new forms ; then, according to Mr. Galton, there will be that reversion to mediocrity to which, so far as birth variations are concerned, fixity of species, when it occurs, is mainly due.

So, then, while it is pretty clear that the Darwinism of Darwin is not the simple and self-consistent theory which it is sometimes supposed to be, while it is obvious that the great evolutionists of the day do something more than offer an exposition of Darwinism, we also venture to say that Neo-Darwinism has done nothing to remove the inherent discrepancy which exists, and surely must ever exist, between the logical demands of the self-consistent theory and the actual facts of the organic world.

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