Limits of Natural Selection

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Few scientific theories have met with such a cordial reception by the world of scientific investigators, or created is so short a time so complete a revolution in general philosophy, as the doctrine of the derivation of organic species by Natural Selection; perhaps in this respect no other can compare with it when we consider the incompleteness of the proofs on which it still relies, or the previous prejudice against the main thesis implied in it, the theory of the development or transmutation of species. The Newtonian theory of gravity, or Harvey's theory of the circulation of the blood, in spite of the complete and overwhelming proofs by which these were soon substantiated, were much longer in overcoming to the same degree the deeply-rooted prejudices and preconceptions opposed to them. In less than a decade the doctrine of Natural Selection had conquered the opposition of the great majority of the students of natural history, as well as of the students of general philosophy; and it seems likely that we shall witness the unparalleled spectacle of an all but universal reception by the scientific world of a revolutionary doctrine in the lifetime of its author; though by the rigorous tests of scientific induction it will yet hardly be entitled to more than the rank of a very probable hypothesis. How is this singular phenomenon to be explained? Doubtless in great part by the extraordinary skill which Mr. Darwin has brought to the proof and promulgation [p. 98] of his views. To this, Mr. Wallace thus testifies in the Preface to his book:[1]

> "The present work will, I venture to think, prove that I both saw at the time the value and scope of the law which I had discovered, and have since been able to apply it to some purpose in a few original lines of investigation. But here my claims cease. I have felt all my life, and I still feel, the most sincere satisfaction that Mr. Darwin had been at work long before me, and that it was not left for me to attempt to write 'The Origin of Species.' I have long since measured my own strength, and know well that it would be quite unequal to that task. Far abler men than myself may confess that they have not that untiring patience in accumulating and that wonderful skill in using large masses of facts

of the most varied kinds, -- that wide and accurate physiological knowledge, -- that acuteness in devising, and skill in carrying out, experiments, and that admirable style of composition, at once clear, persuasive, and judicial, -- qualities which, in their harmonious combination, mark out Mr. Darwin as the man, perhaps of all men now living, best fitted for the great work he has undertaken and accomplished."

But the skillful combination of inductive and deductive proofs with hypothesis, though a powerful engine of scientific discovery, must yet work upon the basis of a preceding and simpler induction. Pythagoras would never have demonstrated the "forty-seventh," if he had not had some ground of believing in it beforehand. The force and value of the preceding and simpler induction have been obscured in this case by subsequent investigations. And yet that more fundamental evidence accounts for the fact that two such skillful observers and reasoners as Mr. Wallace and Mr. Darwin arrived at the same convictions in regard to the derivation of species, in entire independence of each other, and were constrained to accept the much-abused and almost discarded "transmutation hypothesis." And both moreover reached, independently, the same explanation of the process of derivation. This was obviously from their similar experiences as naturalists; from the force of the same obscure and puzzling facts which their studies of the geographical distributions of animals and plants had brought to their notice, though the Malthusian doctrine of [p. 99] population was, doubtless, the original source of their common theory. Mr. Darwin, in the Introduction to his later work on "The Variation of Animals and Plants under Domestication," attributes the beginnings of his speculations to the phenomena of the distributions of life over large continental areas, and in the islands of large archipelagos[*sic*], and especially refers to the curious phenomena of life in the Galapagos Islands in the Pacific Ocean. Mr. Wallace, in his first essay, originally published in 1855, four years earlier than " The Origin of Species," refers to the same class of facts, and the same special facts in regard to the Galapagos Islands, as facts which demand the transmutation hypothesis for their sufficient explanation.

While then much is to be credited to the sagacity and candor of these most accomplished travelers and observers in appreciating the force of obscure and previously little studied facts, yet their theoretical discussions of the hypothesis brought forward to explain them have been of still more importance in arousing an ever-increasing activity in the same field, and in creating a new and most stimulating interest in the external economy of life, -- in the relations of living beings to the special conditions of their existence. And so the discussion is no longer closet work. It is no web woven from self-consuming brains, but a vast accumulation of related facts of observation, bound together by the bond of what must still be regarded as an hypothesis, -- an hypothesis, however, which has no rival with any student of nature in whose mind reverence does not, in some measure, neutralize the aversion of the intellect to what is arbitrary.

In anticipating the general acceptance of the doctrine which Mr. Darwin and Mr. Wallace have done so much to illustrate, we ought to except those philosophers who, from a severe, ascetic, and self-restraining temper, or from preoccupation with other researches, are disposed to regard such speculations as beyond the proper province of scientific inquiry. But to stop short in a research of "secondary causes," so long as experience or reason can suggest any derivation of laws and relations in nature which must otherwise be accepted [p. 100] as ultimate facts, is not agreeable to that Aristotelian type of mind which scientific culture so powerfully tends to produce. Whatever the theological tendencies of such a mind, whether ultimate facts are regarded by it as literally arbitrary, the decrees of an absolute will, or are summarily explained by what Professor De Morgan calls " that exquisite *atheism,* 'the nature of things,'" it still cannot look upon the intricate system of adaptations, peculiar to the organic world (which illustrates what Cuvier calls "the principle *of the conditions of existence,* vulgarly called the principle *of final causes*"), -- it cannot look upon this as an arbitrary system, or as composed of facts independent of all ulterior facts (like the axioms of mechanics or arithmetic or geometry), so long as any explanation, not tantamount to arbitrariness itself, has any probability in the order of nature. This scientific instinct stops far short of an irreverent attitude of mild, though it does not permit things that claim its reverence to impede its progress. And so a class of facts, of which the organical sciences had previously made some use as instruments of scientific discovery, but which was appropriated especially to the reasonings of Natural Theology, has

fallen to the province of the discussions of Natural Selection, and has been wonderfully enlarged in consequence. It cannot be denied that this change has weakened the force of the *arguments* of Natural Theology; but it is simply by way of subtraction or by default, and not as offering any arguments opposed to the main conclusions of theology. "Natural Selection is not inconsistent with Natural Theology," in the sense of refuting the main conclusions of that science; it only reduces to the condition of an arbitrary assumption one important point in the interpretation of special adaptations in organic life, namely, the assumption that in such adaptations foresight and special provision is shown, analogous to the designing, anticipatory imaginings and volitions in the mental actions of the higher animals, and especially in the mind of man.

Upon this point the doctrine of Natural Selection assumes only such general anticipation of the wants or advantages of [p. 101] an animal or plant as is implied in the laws of inheritance. That is, an animal or plant is produced adapted to the *general* conditions of its existence, with only such anticipations of a change or of varieties in these conditions as is implied in its *general* tendency to vary from the inherited type. Particular uses have no special causal relations to the variations that occur and become of use. In other words, Natural Selection, as an hypothesis, does not assume, and, so far as it is based on observation, it affords no evidence, that any adaptation is specially anticipated in the order of nature. From this point of view, the wonderfully intricate system of special adaptations in the organic world is, at any epoch of its history, altogether retrospective. Only so far as the past affords a type of the future, both in the organism itself and in its external conditions, can the conditions of existence be said to determine the adaptations of life. As thus interpreted, the doctrine of Final Causes is deprived of the feature most obnoxious to its opponents, that abuse of the doctrine "which makes the cause to be engendered by the effect." But it is still competent to the devout mind to take a broader view of the organic world, to regard, not its single phases only, but the whole system from its first beginnings as presupposing all that it exhibits, or has exhibited, or could exhibit, of the contrivances and adaptations which may thus in one sense be said to be foreordained. In this view, however, the organical sciences lose their traditional and peculiar value to the arguments of Natural Theology, and become only a part of the universal order of nature, like the physical sciences generally, in the principles of which philosophers have professed to find no sign of a divinity. But may they not, while professing to exclude the *idea* of God from their systems, have really included him unwittingly, as immanent in the very thought that denies, in the very systems that ignore him?

So far as Natural Theology aims to prove that the principles of utility and adaptation are all-pervasive laws in the organic world, Natural Selection is not only not inconsistent, but is identical with it. But here Natural Selection pauses. It does not go on to what has been really the peculiar province of Natural [p. 102] Theology, to discover, or trace the analogies of organic adaptations to proper designs, or to the anticipations of wants and advantages in the mental actions of man and the higher animals. In themselves these mental actions bear a striking resemblance to those aspects of organic life in general, which Natural Selection regards; and according to the views of the experiential psychologist, this resemblance is not a mere analogy. In themselves, and without reference to the external uses of these mental actions, they are the same generalized reproductions of a past experience as those which the organic world exhibits in its laws of inheritance, and are modified by the same tentative powers and processes of variation, but to a much greater degree. But here the resemblance ceases. The relations of such mental actions to the external life of an organism, in which they are truly prophetic and providential agencies, though founded themselves on the observation of a past order in experience, are entirely unique and unparalleled, so far as any assumption in the doctrine of Natural Selection, or any proofs which it adduces are concerned. Nevertheless a greater though vaguer analogy remains. *Some* of the wants and adaptations of men and animals are anticipated by their designing mental actions. Does not a like foreseeing power, ordaining and governing the whole of nature, anticipate and specially provide for *some* of its adaptations? This appears to be the distinctive position in which Natural Theology now stands.

We have dwelt somewhat at length on this aspect of our author's subject, with reference to its bearing on his philosophical views, set forth in his concluding essay on "The Limits of Natural Selection as applied to Man," in which his theological position appears to be that which

we have just defined. We should like to quote many passages from the preceding essays, in illustration of the principle of utility and adaptation, in which Mr. Wallace appears at his best; but one example must suffice. "It is generally acknowledged that the best test of the truth and completeness of a theory is the power which it gives us of prevision"; and on this ground Mr. Wallace justly claims great weight for the following inquiry into the " use of the gaudy [p. 103] colors of many caterpillars," in the essay on Mimicry, etc., p. 117:

> "Since this essay was first published, a very curious difficulty has been cleared up by the application of the general principle of protective coloring. Great numbers of caterpillars are so brilliantly marked and colored as to be very conspicuous even at a considerable distance, and it has been noticed that such caterpillars seldom hide themselves. Other species, however, are green or brown, closely resembling the colors of the substances on which they feed; while others again imitate sticks, and stretch themselves out motionless from a twig, so as to look like one of its branches. Now, as caterpillars form so large a part of the food of birds, it was not easy to understand why ally of them should have such bright colors and markings as to make them specially visible. Mr. Darwin had put the case to me as a difficulty from another point of view, for he had arrived at the conclusion that brilliant coloration in the animal kingdom is mainly due to sexual selection, and this could not have acted in the case of sexless larvæ. Applying here the analogy of other insects, I reasoned, that since some caterpillars were evidently protected by their imitative coloring, and others by their spiny or hairy bodies, the bright colors of the rest must also be in some way useful to them. I further thought, that as some butterflies and moths were greedily eaten by birds while others were distasteful to them, and these latter were mostly of conspicuous colors, so probably these brilliantly colored caterpillars were distasteful and therefore never eaten by birds. Distastefulness alone would, however, be of little service to caterpillars, because their soft and juicy bodies are so delicate, that if seized and afterwards rejected by a bird they would almost certainly be killed. Some constant and easily perceived signal was therefore necessary to serve as a warning to birds never to touch these uneatable kinds, and a very gaudy and conspicuous coloring, with the habit of fully exposing themselves to view, becomes such a signal, being in strong contrast with the green and brown tints and retiring habits of the eatable kinds. The subject was brought by me before the Entomological Society (see Proceedings, March 4, 1867), in order that those members having opportunities for making observations might do so in the following summer," etc.

Extensive experiments with birds, insectivorous reptiles, and spiders, by two British naturalists, were published two years later, and fully confirmed Mr. Wallace's anticipations. His book is full of such curious matters.

In a controversial essay called "Creation by Law," an answer to various criticisms of the doctrine of Natural Selection, Mr. Wallace is equally happy and able; and in his essay on [p. 104] "The Action of Natural Selection on Man," he shows a wonderful sagacity and skill in developing a new phase of his subject, while meeting, as in so many other cases, obstacles and objections to the theory. It appears, both by geological evidence and by deductive reasonings in this essay, that the human race is singularly exempt from variation and the action of Natural Selection, so far as its merely physical qualities are concerned. This follows from theoretical considerations, since the race has come to depend mainly on its mental qualities, and since it is on these, and not on its bodily powers, that Natural Selection must act. Hence the small amount of physical differences between the earliest men of whom the remains have been found and the men of the present day, as compared to differences in other and contemporary races of mammals. We may generalize from this and from Mr. Darwin's observation on the comparatively extreme variability of plants, that in the scale of life there Is a gradual decline in physical variability, as the organism has gathered into itself resources for meeting the exigencies of changing external conditions; and that while in the mindless and motionless plant these resources are at a *minimum,* their *maximum* is reached in the mind of man, which, at length, rises to a level with the total order and powers of nature, and in its scientific comprehension of nature is a summary, an epitome of the world. But the scale of life determined by the number and variety of actual resources in an organism ought to be

distinguished from the rank that depends on a high degree of specialty in particular parts and functions, since in such respects an organism tends to be highly variable.

But Mr. Wallace thinks, and argues in his concluding essay, that this marvelous being, the human mind cannot be a product of Natural Selection; that some, at least, of the mental and moral qualities of mall are beyond the jurisdiction and measure of utility; that Natural Selection has its limits, and that among the most conspicuous examples of its failure to explain the order of nature are the more prominent and characteristic distinctions of the human race, Some of these, according [p. 105] to Mr. Wallace, are physical; not only the physical instruments of man's mental nature, his voluminous brain, his cunning hand, the structure and power of his vocal organs, but also a characteristic which appears to have no relation to his mental nature, -- his nakedness. Man is distinguished from all soft and delicate skinned terrestrial mammals in having no hairy covering to protect his body. In other mammals the hair is a protection against rain, as is proved by the manner in which it is disposed, -- a kind of argument, by the way, especially prized by Cuvier, which has acquired great validity since Harvey's reasonings on the valves of the veins.[2] The backs of these animals are more especially protected in this way, But it is front the back more especially that the hairy covering is missed in the whole human race; and it is so effectually abolished as a character of the species, that it never occurs even by such reversions to ancestral types as are often exhibited in animal races. How could this covering have ever been [p. 106] injurious, or other than useful to men? Or, if at any time in the past history of the race it was for any unknown reason injurious; why should not the race, or at least some part of it, have recovered from the loss and acquired anew so important a protection ? Mr. Wallace is not unmindful of Mr. Darwin's doctrine of Correlated Variation, and the explanation it affords of useless and even injurious characters in animals; but he limits his consideration of it to the supposition that the loss of hair by the race might have been a physiological consequence of correlation with some past unknown hurtful qualities. From such a loss, however, he argues, the race ought to have recovered. But he omits to consider the possible correlation of the absence of hair with qualities not necessarily injurious, but useful, which remain and equally distinguish the race. Many correlated variations are quite inexplicable. "Some are quite whimsical: thus cats, which are entirely white and have blue eyes, are generally deaf," and very few instances could be anticipated from known physiological laws, such as homological relations. There is, however, a case in point, cited by Mr. Darwin, the correlation of imperfect teeth with the nakedness of the hairless Turkish dog. If the intermediate varieties between men and the man-apes had been preserved, and a regular connection between the sizes of their brains, or developments of the nervous system, and the amount of hair on their backs were observed, this would be as good evidence of correlation between these two characters as that which exists in most cases of correlation. But how in the absence of any evidence to test this or any other hypothesis, can Mr. Wallace presume to say that the law of Natural Selection cannot explain such a peculiarity? It may be that no valid proof is possible of ally such explanation, but how is he warranted in assuming on that account some exceptional and wholly occult cause for it? There is a kind of correlation between the presence of brains and the absence of hair which is not of so obscure a nature, and may serve to explain in part, at least, why Natural Selection has not restored tile protection of a hairy coat, however it may have been lost. Mr. Wallace himself [p. 107] signalizes this correlation in the preceding essay. It is that through which art supplies to man in a thousand ways the deficiencies of nature, and supersedes the action of Natural Selection. Every savage protects his back by artificial coverings. Mr. Wallace cites this fact as a proof that the loss of hair is a defect which Natural Selection ought to remedy. But why should Natural Selection remedy what art has already cared for? In this essay Mr. Wallace seems to us to have laid aside his usual scientific caution and acuteness, and to have devoted his powers to the service of that superstitious reverence for human nature which, not content with prizing at their worth the actual qualities and acquisitions of humanity, desires to intrench [*sic*] them with a deep and metaphysical line of demarkation[*sic*].

There are, doubtless, many and very important limitations to the action of Natural Selection, which the enthusiastic student of the science ought to bear in mind; but they belong to the application of the principle of utility to other cases as well as to that of the derivation of human nature. Mr. Wallace regards the vocal powers of the human larynx as beyond the generative action of Natural Selection, since the savage neither uses nor appreciates all its

powers. But the same observation applies as well to birds, for certain species, as he says in his essay on "The Philosophy of Birds' Nests," "which have naturally little variety of song, are ready in confinement to learn from other species, and become much better songsters." It would not be difficult to prove that the musical capacities of the human voice involve no elementary qualities which are not involved in the cadences of speech, and in such other powers of expression as are useful at least, if not indispensable, in language. There are many consequences of the ultimate laws or uniformities of nature, through which the acquisition of one useful power will bring with it many resulting advantages, as well as limiting disadvantages, actual or possible, which the principle of utility may not have comprehended in its action. This principle necessarily presupposes a basis in an antecedent constitution of nature, in principles of fitness, and laws of cause and effect, in the origin of which it has had no agency. The question of the origin of this constitution, if it be a proper question, belongs to metaphysical philosophy, or, at least, to its pretensions. Strictly speaking, Natural Selection is not a cause at all, but is the mode of operation of a certain quite limited class of causes.[3] Natural Selection never made it come to pass, as a habit of nature, that an unsupported stone should move downwards rather than upwards. It applies to no part of inorganic nature, and is very limited even in the phenomena of organic life.

In his obvious anxiety to establish for the worth of human nature the additional dignity of metaphysical isolation, Mr. Wallace maintains the extraordinary thesis that "the brain of [p. 109] the savage is larger than he needs it to be"; from which he would conclude that there is in the size of the savage's brain a special anticipation or prophecy of the civilized man, or even of the philosopher, though the inference would be far more natural, and entirely consistent with Natural Selection, that the savage has degenerated from a more advanced condition. The proofs of our author's position consist in showing that there is a very slight difference between the average size of the savage's brain and that of the European, and that even in prehistoric man the capacity of the skull approaches very near to that of the modern man, as compared to the largest capacity of anthropoid skulls. Again, the size of the brain is a measure of intellectual power, as proved by the small size of idiotic brains, and the more than average size of the brains of great men, or "those who combine acute perception with great reflective powers, strong passions, and general energy of character." By these considerations "the idea is suggested of a surplusage of power, of an instrument beyond the needs of its possessor."

From a rather artificial and arbitrary measure of intellectual power, the scale of marks in university examinations, as compared to the range of sizes in brains, Mr. Wallace concludes it to be fairly inferred, "that the savage possesses a brain capable, if cultivated and developed, of performing work of a kind and degree far beyond what he ever requires it to do." But how far removed is this conclusion from the idea that the savage has more brains than he needs! Why may it not be that all that he can do with his brains beyond his needs is only incidental to the powers which are directly serviceable? Of what significance is it that his brain is twice as great as that of the man-ape, while the philosopher only surpasses him one sixth, so long as we have no real measure of the brain power implied in the one universal characteristic of humanity, the power of language, -- that is, the power to invent and use arbitrary signs?

Mr. Wallace most unaccountably overlooks the significance of what has always been regarded as the most important distinction of the human race,--its rationality as shown in language.[p. 110] He even says that "the mental requirements of savages, and the faculties actually exercised by them, are very little above those of animals." We would not call in question the accuracy of Mr. Wallace's observations of savages; but we can hardly accord equal credit to his accuracy in estimating the mental rank of their faculties. No doubt the savage mind seems very dull as compared with the sagacity shown by many animals; but a psychological analysis of the faculty of language shows that even the smallest proficiency in it might require more brain power than the greatest in any other direction. For this faculty implies a complete inversion of the ordinary and natural orders of association in the mind, or such an inversion as in mere parroting would be implied by the repetition of the words of a sentence in an inverse order, -- a most difficult feat even for a philosopher. "The power of abstract reasoning and ideal conception," which Mr. Wallace esteems as a very great advance on the savage's proficiency, is but another step in the same direction, and here, too, *ce n'est que le premier pas qui coûte.* It seems probable enough that brain power proper, or its spontaneous

and internal determinations of the perceptive faculties, should afford directly that *use* or *command* of a *sign* which is implied in language, and essentially consists in the power of turning back the attention from a suggested fact or idea to the suggesting ones, with reference to their use, in place of the naturally passive following and subserviency of the mind to the orders of first impressions and associations. By inverting the proportions which the latter bear to the forces of internal impressions, or to the powers of imagination in animals, we should have a fundamentally new order of mental actions; which, with the requisite motives to them, such as the social nature of man would afford, might go far towards defining the relations, both mental and physical, of human races to the higher brute animals. Among these the most sagacious and social, though they may understand language, or follow its significations, and even by indirection acquire some of its uses, yet have no direct *power of using,* and no power of *inventing* it.[p. 111]

But as we do not know, and have no means of knowing, what is the quantity of intellectual power, as measured by brains, which even the simplest use of language requires, how shall we be able to measure on such a scale the difference between the savage and the philosopher; which consists, not so much in additional elementary faculties in the philosopher, as in a more active and persistent use of such faculties as are common to both; and depends on the external inheritances of civilization, rather than on the organic inheritances of the civilized man? It is the *kind* of mental acquisition of which a race may be capable, rather than the amount which a trained individual may acquire, that we should suppose to be more immediately measured by the size of the brain; and Mr. Wallace has not shown that this *kind* is not serviceable to the savage. Idiots have sometimes great powers of acquisition of a certain low order of facts and ideas. Evidence upon this point, from the relations of intellectual power to the growth of the brain in children, is complicated in the same way by the fact that powers of acquisitions are with difficulty distinguished from, and are not a proper measure of, the intellectual powers, which depend directly on organic conditions, and are independent of an external inheritance.

But Mr. Wallace follows, in his estimations of distinct mental faculties, the doctrines of a school of mental philosophy which multiplies the elementary faculties of the mind far beyond any necessity. Many faculties are regarded by this school as distinct, which are probably only simple combinations or easy extensions of other faculties. The philosopher's mental powers are not necessarily different in their elements from those which the savage has and needs in his struggle for existence, or to maintain his position in the scale of life and the resources on which he has come to depend. The philosopher's powers are not, it is true, the direct results of Natural Selection, or of utility; but may· they not result by the elementary laws of mental natures and external circumstances, from faculties that *are* useful? If they imply faculties which are useless to the savage, we have still the natural alternative left us, which Mr. Wallace does not consider, that savages, or all the races of [p. 112] savages now living, are degenerate men, and not the proper representatives of the philosopher's ancestors. But this alternative, though the natural one, does not appear to us as necessary; for we are not convinced that "the power of conceiving eternity and infinity, and all those purely abstract notions of form, number, and harmony, which play so large a part in the life of civilized races," are really so "entirely outside of the world of thought of the savage" as our author thinks. Are they not rather implied and virtually acquired in the powers that the savage has and needs, -- his powers of inventing and using even the concrete terms of his simple language? The fact that it does not require Natural Selection, but only the education of the individual savage, to develop in him these results, is to us a proof, not that the savage is specially provided with faculties beyond his seeds, nor even that he is degenerated, but that mind itself, or elementary mental natures, in the savage and throughout the whole sentient world, involve and imply such relations between actual and potential faculties; just as the elementary laws of physics involve many apparently, or at first sight distinct and independent applications and utilities. Ought we to regard the principle of "suction," applied to the uses of life in so many and various animal organisms, as specially prophetic of the mechanical invention of the pump and of similar engines? Shall we say that in the power of "suction" an animal possesses faculties that he does not need? Natural Selection cannot, it is true, be credited with such relations in development. But neither can they be attributed to a special providence in any intelligible sense. They belong rather to that constitution of nature, or general providence, which Natural Selection presupposes.

The theories of associational psychology are so admirably adapted to the solution of problems, for which Mr. Wallace seems obliged to call in the aid of miracles, that we are surprised he was riot led by his studies to a more careful consideration of them. Thus in regard to the nature of the moral sense, which Mr. Wallace defines in accordance with the intuitional theory as "a feeling, -- a sense of right and wrong, -- in our nature, antecedent to, and independent of, experiences of [p. 113] utility," -- this sense is capable of an analysis which meets and answers very simply the difficulties he finds in it on the theory of Natural Selection. The existence of feelings of approval and disapproval, or of likings and aversions to certain classes of actions, and a sense of obligation, are eminently useful in the government of human society, even among savages. These feelings may be associated with the really useful and the really harmful classes of actions, or they may not be. Such associations are not determined simply by utility, any oftener than beliefs are by proper evidence. But utility tends to produce the proper associations; and in this, along with the increase of these feelings themselves, consists the moral progress of the race. Why should not a fine sense of honor and an uncompromising veracity be found, then, among savage tribes, as in certain instances cited by Mr. Wallace; since moral feelings, or the motives to the observance of rules of conduct, lie at the foundation of even the simplest human society, and rest directly on the utility of man's political nature; and since veracity and honor are not merely useful, but indispensable in many relations, even in savage lives? Besides, veracity being one of the earliest developed instincts of childhood, can hardly with propriety be regarded as an original moral instinct, since it matures much earlier than the sense of obligation, or any feeling of the sanctity of truth. It belongs rather to that social and intellectual part of human nature from which language itself arises. The desire of communication, and the desire of communicating the truth, are originally identical in the ingenuous social nature. Is not this the source of the "mystical sense of wrong," attached to untruthfulness, which is, after all, regarded by mankind at large as so venial a fault ? It needs but little early moral discipline to convert into a strong moral sentiment so natural an instinct. Deceitfulness is rather the acquired quality, so far as utility acts directly on the development of the individual, and for his advantage; but the native instinct of veracity is founded on the more primitive utilities of society and human intercourse. Instead, then, of regarding veracity as an original moral instinct, "antecedent to, and independent of, experiences of utility," it appears to us more [p. 114] natural to regard it as originally an intellectual and social instinct, founded in the broadest and most fundamental utilities of human nature.

The extension of the moral nature beyond the bounds of the necessities and utilities of society does not require a miracle to account for it; since, according to the principles of the associational psychology, it follows necessarily from the elementary laws of the mind. The individual experiences of utility which attach the moral feelings to rules of conduct are more commonly those of rewards and punishments, than of the direct or natural consequences of the conduct itself; and associations thus formed come to supersede all conscious reference to rational ends, and act upon the will in the manner of an instinct. The uncalculating, uncompromising moral imperative is not, it is true, derived from the individual's direct experiences of its utility; but neither does the instinct of the bee, which sacrifices its life in stinging, bear any relation to its individual advantage. Are we warranted, then, in inferring that the sting is useless to the bee? Suppose that whole communities of bees should occasionally be sacrificed to their instinct of self-defense, would this prove their instinct to be independent of a past or present utility, or to be prophetic of some future development of the race? Yet such a conclusion would be exactly parallel to that which Mr. Wallace draws from the fact that savages some times deal honorably with their enemies to their own apparent disadvantage. It is a universal law of the organic world, and a necessary consequence of Natural Selection, that the individual comprises in its nature chiefly what is useful to the race, and only incidentally what is useful to itself; since it is the race, and not the individual, that endures or is preserved. This contrast is the more marked in proportion as a race exhibits a complicated polity or social form of life; and man, even in his savage state, "is more political than any bee or ant." The doctrine of Natural Selection awakens a new interest in the problems of psychology. Its inquiries are not limited to the origin of species. "In the distant future," says Mr. Darwin, "I see open fields for far more important researches. Psychology will be based [p. 115] on a new foundation, -- that of the necessary acquirements of each mental power and capacity by gradation. Light will be thrown on the origin of man and his history." More light we are sure can be expected from such

researches than has been discovered by Mr. Wallace, in the principles and analysis of a mystical and metaphysical psychology.

The " origin of consciousness," or of sensation and thought, is relegated similarly by Mr. Wallace to the immediate agency or interposition of a metaphysical cause, as being beyond the province of secondary causes, which could act to produce it under the principle of Natural Selection. And it is doubtless true, nay, unquestionable, that sensation as a simple nature, with the most elementary laws of its activity, does really belong to the primordial facts in that constitution of nature, which is presupposed by the principle of utility as the ground or condition of the fitnesses through which the principle acts. In like manner the elements of organization, or the capacities of living matter in general, must be posited as antecedent to the mode of action which has produced in it, and through its elementary laws, such marvelous results. But if we mean by "consciousness" what the word is often and more properly used to express,-that total and complex structure of sensibilities, thoughts, and emotions in an animal mind, which is so closely related to the animal's complex physical organization, -- so far is this from being beyond the province of Natural Selection, that it affords one of the most promising fields for its future investigations.[4] Whatever the results of such investigations, [p. 116] we may rest assured that they will not solve; will never even propound the problem peculiar to metaphysics (if it can properly [p. 117] be called a problem), the origin of sensation or simple consciousness, the problem *par excellence* of pedantic garrulity or philosophical childishness. Questions of the special physical antecedents, concomitants, and consequents of special sensations will doubtless continue to be the legitimate objects of empirical researches and of important generalizations; and such researches may succeed in reducing all other facts of actual experience, all our knowledge of nature, and all our thoughts and emotions to intelligible modifications of these simple and fundamental existences; but the attempt to reduce sensation to anything but sensation is as gratuitous and as devoid of any suggestion or guidance of experience, as the attempt to reduce the axioms of the mathematical or mechanical sciences to simpler orders of universal facts. In one sense material phenomena, or physical objective states, are causes or effects of sensations, bearing as they do the invariable relations to them of antecedents, or concomitants, or consequents. But these are essentially empirical relations, explicable perhaps by more and more generalized empirical laws, but approaching in this way never one step nearer to an explanation of material conditions by mental laws, or of mental natures by the forces of matter. Matter and mind co-exist. There are no scientific principles by which either can be determined to be the cause [p. 118] of the other. Still, so far as scientific evidence goes, mind exists in direct and peculiar relations to a certain form of matter, the organic, which is not a different kind, though the properties of no other forms are in themselves capable, so far as scientific observation has yet determined, of giving rise to it. The materials and the forces of organisms are both derived from other forms of matter, as well as from the organic; but the organic form itself appears to be limited to the productive powers of matters and forces which already have this form.

The transcendental doctrine of development (which is not wholly transcendental, since it is guided, at least vaguely, by the scientific principles of cause and effect, or by the continuities and uniformities of natural phenomena) assumes that in the past course of nature the forms as well as the materials and forces of organic matter had at one time a causal connection with other forms of material existence. Mental natures, and especially the simplest, or sensations, would have had, according to this assumption, a more universal relation of immediate connection than we now know with properties of the sort that we call material. Still, by the analogies of experience they cannot be regarded as having been either causes or effects of them. Our ignorances, or the as yet unexplored possibilities of nature, seem far preferable to the vagueness of this theory, which, in addition to the continuities and uniformities universally exhibited in nature, assumes transcendentally, as a universal first principle, the law *of progressive change,* or a law which is *not* universally exemplified by the course of nature. We say, and say truly, that a stone has no sensation, since it exhibits none of the signs that indicate the existence of sensations. It is not only a purely objective existence, like everything else in nature, except our own individual self-consciousness, but its properties indicate to us no other than this purely objective existence, unless it be the existence of God. To suppose that its properties could possibly result in a sensitive nature, not previously existing or co-existing with them, is to reason entirely beyond the guidance and analogies of experience. It is a purely

gratuitous supposition, not only metaphysical or transcendental, but also materialistic; that is, it is not only asking a foolish question,[p. 119] but giving a still more foolish answer to it. In short, the metaphysical problem may be reduced to an attempt to break down the most fundamental antithesis of all experience, by demanding to know of its terms which of them is the other. To this sort of fatuity belongs, we think, the mystical doctrine which Mr. Wallace is inclined to adopt, "that FORCE is a product of MIND"; which means, so far as it is intelligible, that forces, or the physical antecedents and conditions of motion (apprehended, it is true, along with motion itself through our sensations and volitions), yet bear to our mental natures the still closer relation of resemblance to the prime agency of the Will; or it means that "all force is probably will-force." Not only does this assumed mystical resemblance, expressed by the word "will-force," contradict the fundamental antithesis of subject and object phenomena (as the word "mind-matter" would), but it fails to receive any confirmation from the law of the correlation of the physical forces. All the motions of animals, both voluntary and involuntary, are traceable to the efficiency of equivalent material forces in the animal's physical organization. The cycles of equivalent physical forces are complete, even when their courses lie through the voluntary actions of animals, without the introduction of conscious or mental conditions. The sense of effort is not a form of force. The painful or pleasurable sensations that accompany the conversions of force in conscious volitions are not a consciousness of this force itself, nor even a proper measure of it. The Will is not a measurable quantity of energy, with its equivalents in terms of heat, or falling-force, or chemical affinity, or the energy of motion, unless we identify it with the vital energies of the organism, which are, however (unfortunately for this hypothesis), the causes of the involuntary movements of an animal, as well as of its proper volitions considered from their physical side.

But Mr. Wallace is inclined to the opinion that the Will is an incident force, regulating and controlling the action of the physical forces of the vital machine, but contributing, even in this capacity, some part at least to the actual moving forces of the living frame. He says:

> "However delicately a machine may be constructed, with the most exquisitely[p. 120] contrived detents to release a weight or spring by the exertion of the smallest possible amount of force, *some* external force will always be required; so in the animal machine, however minute may be the changes required in the cells or fibres of the brain, to set in motion the nerve currents that loosen or excite the pent-up forces of certain muscles, *some force* must be required. to effect those changes."

And this force he supposes to be the Will. This is the most intelligible materialism we have ever met with in the discussions of this subject. It is true that in a machine, not only the main efficient forces, but also the incident and regulating ones, are physical forces; and however small the latter may be, they are still of the same nature, and are comparable in amount with the main efficient forces. But is not this one of the most essential differences between a machine and a sensitive organism? Is it impossible, then, that nature has contrived an infinitely more perfect machine than human art can invent, -- machinery which involves the powers of are itself, if it be proper to call that contrivance a machine, in which the regulating causes are of a wholly different nature from the efficient forces? May it not he that sensations and mental conditions, generally, are regulating causes which add nothing, like the force of the hand of the engineer to the powers which he controls in his machine, and subtract nothing, as an automatic apparatus does, from such powers in the further regulation of the machine? We may not be able to understand how such regulation is possible; how sensations and other mental conditions can restrain, excite, and combine the conversions of physical forces in the cycles into which they themselves do not enter; though there is a type of such regulation in the principles of theoretical mechanics, in the actions of forces which do not affect the quantities of the actual or potential energies of a system of moving bodies, but simply the form of the movement, as in the rod of the simple pendulum. Such regulation in the sensitive organism is more likely to be an ultimate inexplicable fact; but it is clear that even in a machine the amounts of the regulating forces bear no definite relations to the powers they control, and might, so far as these are directly concerned, be reduced to nothing as forces; and in many cases they are reduced to a *minimum* of the force of friction. They must,[p. 121 however, be *something* in amount in a machine, *because they are physical*, and, like all physical forces, must be derived in quantity from pre-existing forms of force. To infer from this that the Will must add something

to the forces of the organism is, therefore, to assume for it a material nature. But Mr. Wallace escapes, or appears to think (as others think who hold this view) that he escapes, from complete materialism by the doctrine of the freedom of the Will. Though he makes the Will an efficient physical force, he does not allow it to be a physical effect. In other words, he regards the Will as an absolute source of physical energy, continually adding, though in small amounts, to the store of the forces of nature; a sort of molecular leakage of energy from an absolute source into the nervous system of animals, or, at least, of men. This, though in our opinion an unnecessary and very improbable hypothesis, is not inconceivable. It is improbable, inasmuch as it denies to the Will a character common to the physical forces with which the Will is otherwise assimilated by this theory, -- the character, namely, of being an effect in measurable amount as well as a cause, or the character of belonging to cycles of changes related by invariable quantities: but as we do not regard the conservation of force as a *necessary* law of the universe, we are able to comprehend Mr. Wallace's position. It is the metaphysical method of distinguishing a machine from a sensitive organism. But we do not see why Mr. Wallace is not driven by it to the dilemma of assuming free-wills for all sentient organisms; or else of assuming, with Descartes, that all but men are machines. The latter alternative would, doubtless, redound most effectively to the metaphysical dignity of human nature. Mr. Wallace appears to think that unless we can attribute to the Will *some* efficiency or quantity of energy, its agency must be regarded as a nullity, and our apparent consciousness of its influence as an illusion; but this opinion appears to be based on the still broader assumption, which seems to us erroneous, that all causation is reducible to the conversions of equivalent physical energies. It may be trite (at least we are not prepared to dispute the assumption) that every case of real causation involves such conversions or [p. 122] changes in forms of energy, or that every effect involves changes of position and motion. Nevertheless, every case of real causation may still involve also another mode of causation. A much simpler conception than our author's theory, and one that seems to us far more probable is that the phenomena of conscious volition involve in themselves no proper efficiencies or forces coming under the law of the conservation of force, but are rather natural types of causes, purely and absolutely *regulative,* which add nothing to, and subtract nothing from, the quantities of natural forces. No doubt there is in the actions of the nervous system a much closer resemblance than this to a machine. No doubt it is automatically regulated, as well as moved, by physical forces; but this is probably just in proportion as its agency -- as in our habits and instincts -- is removed from our conscious control. All this machinery is below, beyond, external, or foreign to our consciousness. The profoundest, most attentive introspection gains not a glimpse of its activity, nor do we ever dream of its existence; but both by the laws of its operations, and by the means through which we become aware of its existence, it stands in the broadest, most fundamental contrast to our mental natures; and these, so far from furnishing a type of physical efficiency in our conscious volitions, seem to us rather, in accordance with their general contrast with material phenomena, to afford a type of purely regulative causes, or of an absolutely forceless and unresisted control and regulation of those forces of nature which are comprised in the powers of organic life. Perhaps a still higher type of such regulation is to be found in those "laws of nature," which, without adding to, or subtracting from, the real forces of nature, determine the order of their conversions by "*fixed, stated,* or *settled*" rules of succession; and these may govern also, and probably do govern, the successions of our mental or self-conscious states, both in themselves and in their relations to material conditions. Simple, absolute, invariable rules of succession in phenomena, both physical and mental, constitute the most abstract conception we can have of causal relations; but they appear under two chief classes, the [p. 123] physical laws which determine the possible relations of the forms of force, and those which are also concerned in the still further determination of its actual orders of succession, or which, by their combinations in the intricate web of uniformities in nature, both mental and physical, determine the events in particular that in relation to the laws of force are only determined in general. The proper laws of force, or of the conversions of energy, are concerned exclusively with relations in space. Relations in time are governed by the other class of laws. Thus, in the abstract theory of the pendulum, the phenomena of force involved are limited simply to the vertical rise and fall of the weight, upon which alone the amounts of its motions depend. The times of its vibrations are determined by the regulating length of the rod, which in theory adds nothing to, and subtracts nothing from, the efficient mutually convertible forces of motion and gravity. What is here assumed in theory to be true, we assume to be actually and absolutely true of mental agencies.

But it may be said, and it often is said, "that this theory of the Will's agency is directly contradicted in both its features by consciousness; that we are immediately conscious both of energy and freedom in willing." There is much in our volitional consciousness to give countenance to this contradiction; but it is only such as dreams give to contradictions of rational experience. The words "force," "energy," "effort," "resistance," "conflict," all point to states of feeling in our volitional consciousness which seem to a superficial observation to be true intuitions of spontaneous self-originated causes; and it is only when these states of feeling are tested by the scientific definitions and the objective measure of forces, and by the orders of the conversions of force, that they are found to be only vague, subjective accompaniments, instead of distinct objective apprehensions or perceptions of what "force" signifies in science. Such tests prove them to be like the complementary or subjective colors of vision. In one sense they are intuitions of force, our only intuitions of it (as the aspects of nature are our only intuitions of the system of the world); but they are not true perceptions, since they do not afford, each [p. 124] feeling in itself, definite and invariable indications of force as an objective existence, or as affecting all minds alike. Even the sense of weight is no proper measure of weight as an element of force; and the muscular effort of lifting is only a vague and variable perception of this conversion of force, and does not afford even a hint of the great law of the conservation and convertibility of forces, but, on the contrary, seems to contradict it. The muscular feeling of resistance to motion or to a change of motion is an equally vague measure of *inertia*. Indeed, the feelings of weight and resistance, which are often regarded as intuitions of gravity and inertia, are insusceptible of precise measurement or numerical comparison; and though capable of being trained to some degree of precision in estimating what is properly measured by other means, they could never have revealed through their unaided indications the law of the fixed and universal proportionality of these two forces. The feeling of effort itself (more or less intense, and more or less painful, according to circumstances, which are quite irrelevant to its apparent effect) appears by the testimony of consciousness to be the immediate cause of the work which is done, -- work really done by forces in the vital organism, which only the most recondite researches of science have disclosed. But if this much-vaunted authority of immediate consciousness so blunders in even the simplest cases, how can our author or any judicious thinker trust its unconfirmed, unsupported testimony in regard to the agency of the Will? Is it not like trusting the testimony of the senses as to the immobility of the earth?

With hardly a point, therefore, of Mr. Wallace's concluding essay are we able to agree; and this impresses us the more, since we find nothing in the rest of his book which appears to us to call for serious criticism, but many things, on the contrary, which command our most cordial admiration. We account for it by the supposition that his metaphysical views, carefully excluded from his scientific work, are the results of an earlier and less severe training than that which has secured to us his valuable positive contributions to the theory of Natural Selection. Mr. Wallace himself is fully aware of this contrast, and anticipates a scornful rejection of his theory by many who in other respects agree with him.

The doctrines of the special and prophetic providences and decrees of God, and of the metaphysical isolation of human nature, are based, after all, on barbaric conceptions of dignity, which are restricted in their application by every step forward in the progress of science. And the sense of security they give us of the most sacred things is more than replaced by the ever-growing sense of the universality of inviolable laws, -- laws that underlie our sentiments and desires, as well as all that these can rationally regard in the outer world. It is unfortunate that the prepossessions of religious sentiment in favor of metaphysical theories should make the progress of science always seem like an indignity to religion, or a detraction from what is held as most sacred; yet the responsibility for this belongs neither to the progress of science nor to true religious sentiment, but to a false conservatism, an irrational respect for the ideas and motives of a philosophy which finds it more and more difficult with every advance of knowledge to reconcile its assumptions with facts of observation.

Footnotes

[1] Contributions to the Theory of Natural Selection. A Series of Essays. By Alfred Rupell[*sic*] Wallace, London, 1870.

[2] It is remarkable that our author should be so willing to attribute such a slight and unimportant character as the hair of animals, and even the lay of it, to Natural Selection, and. at the name time, should regard the absence of it from the human back as beyond the resources of natural explanations. We credit him, nevertheless, with the clearest appreciation, through his studies and reflections, of the extent of the action of the law which he independently discovered; which comprises in its scope, not merely the stern necessities of mere existence, bur the gentles amenities of the most favored life. Sexual Selection, with all its obscure and subtle influences, is a type of this gentler action, which ranges all the way in its command of fitnesses from the hard necessities of utility and warfare to the apparently useless superfluities of beauty and affection. Nay, more, a defect which, without subtracting from the attractions or any other important external advantage in an animal, should simply be the source of private discomfort to it, is certain to come under the judgments of this all-searching principle.

It is a fair objection, however, sometimes made against the theory of Natural Selection, that it abounds in loopholes of ingenious escape from the puzzling problems of nature; and that, instead of giving real explanations of many phenomena, it simply refers them in general terms to obscure and little known, perhaps wholly inadequate causes, of which it holds *omne ignotum pro magnifico*. But this objection, though good, so far as it goes, against the theory, is not in favor of any rival hypothesis, least of all of that greatest of unknown causes, the supernatural, which is magnificent indeed in adequacy, if it be only real, but whose reality must rest forever on the negative evidence of the insufficiency, not only of the known, but of all possible natural explanations, and whose sufficiency even is, after all, only the counterpart or reflection of their apparent insufficiencies. Hence the objection is a fair one only against certain phases of this theory, and against the tendency to rest satisfied with its imperfect explanations, or to regard them lightly as trivial defects. But to such criticisms the progress of the theory itself, in the study or nature, is a sufficient answer in general, and is a triumphant vindication of the mode of inquiry, against which such criticisms are sometimes unjustly made.

[3] Though very limited in extent, this class is marked out only by the single character, that the efficient causes (of whatever nature, whether the forces of simple growth and reproduction, or the agency of the human will), are yet of such a nature as to act through the principles of utility and choice. It includes in its range, therefore, developments of the simplest adaptive organic characters on one hand, and the growths of language and other human customs on the other. It has been objected that Natural Selection does not apply to the origin of languages, because language is an invention, and the work of the human will; and it is clear, indeed, that Natural, as distinguished from Artificial, Selection is not properly the cause of language, or of the custom of speech. But to this it is sufficient to reply, that the contrast of Natural and Artificial Selections is not a contrast of principles, but only of illustrations, and that the common principle of "the survival of the fittest" is named by Synecdoche from the broader though more obscure illustration of it. If it can be shown that the choice of a word from among many words as the name of an object or idea, or the choice of a dialect from among many varieties of speech, as the language of literature, is a universal process in the developments of speech and is determined by real, though special grounds of fitness, then this choice is a proper illustration of the principle of Natural Selection; and is the more so, with reference to the name of the principle, in proportion as the process and the grounds of fitness in this choice differ from the common volitions and motives of men, or are obscured by the imperfections of the records of the past, or by the subtleties of the associations which have determined it in the minds of the inventors and adopters of language. It is important, however, to distinguish between the origins of languages or linguistic customs, which are questions of philology, and the psychological question of the origin of language in general, or the origin in human nature of the inventions and uses of speech. Whether Natural Selection will serve to solve the latter question remains to be seen. In connection, however, with the resemblance, here noted, between the primitive, but regularly determined inventions of the mind and Natural Selection in its narrower sense, it is interesting to observe a corresponding resemblance between the theories of Free-will and Creation, which are opposed to them. The objection that the origin of languages does not belong to the inquiries of Natural Selection, because language is an

invention, and the work of Free-Will, thus appears to be parallel to the objection to Natural Selection, that it attempts to explain the work of Creation: and both objections obviously beg the questions at issue. But both objections have force with reference to the real and proper limitations of Natural Selection, and to the antecedent conditions of its action.

[4] In further illustration of the range of the explanations afforded by the principle of Natural Selection, to which we referred in our note, page 108, we may instance an application of it to the more special psychological problem of ~he development of the individual mind by its own experiences, which presupposes, of course, the innate powers and mental faculties derived (whether naturally or supernaturally) from the development of the race. Among these native faculties of the individual mind is the power of reproducing its own past experiences in memory and belief; and this is, at least, analogous, as we have said, to the reproductive powers of physical organisms, and like these is in itself an unlimited, expansive power of repetition. Human beliefs, like human desires, are naturally illimitable. The generalizing instinct is native to the mind. It is not the result or habitual experiences, as is commonly supposed, but acts as well on *single* experiences which are capable of producing, when unchecked, the most unbounded beliefs and expectations of the future. The only checks to such unconditional natural beliefs are *other* and equally unconditional and natural beliefs, or the contradictions and limiting conditions of experience. Here, then, is a close analogy, at least, to those fundamental facts of the organic world on which the law of Natural Selection is based: the facts, namely, of the "rapid increase of organisms," limited only by " the conditions of existence," and by competition in that "struggle for existence" which results in the "survival of the fittest." As the tendency to an unlimited increase in existing organisms is held in check only by those conditions of their existence which are chiefly comprised in the like tendencies of other organisms to unlimited increase, and is thus maintained (so long as external conditions remain unchanged) in an unvarying balance of life: and as this balance adjusts itself to slowly changing external conditions, so, in the history of the individual mind, beliefs which spring spontaneously from simple and single experiences, and from a naturally unlimited tendency to generalization, are held mutually in check, and in their harmony represent the properly balanced experiences and knowledges of the mind, and by adaptive changes are kept in accordance with changing external conditions, or with the varying total results in the memory of special experiences. This mutual limitation of belief by belief, in which consists so large a part of their proper *evidence*, is so prominent a feature in the beliefs of the rational mind, that philosophers had failed to discover their true nature, as elementary facts, until this was painted out by the greatest of living psychologist, Professor Alexander Bain. The mutual tests and checks of belief have, indeed, always appeared to a great majority of philosophers as their only proper evidence; and beliefs themselves have appeared as purely intellectual phases of the mind. But Bain has defined them, in respect to their ultimate natures, as phases of the will; or as the tendencies we have to *act* on mere experience, or to *act* on our simplest, most limited experiences. They are tendencies, however, which become so involved in intellectual developments, and in their mutual limitations, that their ultimate results in rational beliefs have very naturally appeared to most philosophers as purely intellectual facts; and their real genesis in experience has been generally discredited, with the exception of what are designated specially as "empirical beliefs."

It may be objected that the generative process we have here described hears only a remote and fanciful analogy. and not an essential resemblance, to Natural Selection in the organic world. But to this it is, perhaps, sufficient to reply (as in the case of the origin of language), that if "the survival of the fittest " is a true expression of the law, -- it is to Mr. Herbert Spencer we owe this most precise definition, -- then the development of the individual mind presents a true example of it: for our knowledges and rational beliefs result, *truly and literally*, from the survival of the fittest among our original and spontaneous beliefs. It is only by a figure of speech, it is true, that this "survival of the fittest" can be described as die result of a "struggle for existence" among our primitive beliefs; but this description is equally figurative as applied to Natural Selection in the organic world.

The application of the principle to mental development takes for granted, as we have said, the faculties with which the individual is born, and in the human mind these include that most efficient auxiliary, the faculty of using and inventing language. How Natural Selection could have originated this is not so easy to trace, and is an almost wholly speculative question;

but if the faculty consists essentially, as we have supposed, in a preponderance of the active and spontaneous over the passive powers of the brain, effecting the turning-back or reflective action of the mind, while the latter simply result in the following-out or sagacious habit, we see at least that the contrast need not depend on the absolute size of the brain, but only on the *proportion* of the powers that depend on its quantity to those that depend on its quality. We should naturally suppose, therefore, that the earliest men were probably not very sagacious creatures, perhaps much less so than the present uncivilized races. But they were, most likely, very social: even more so, perhaps, than the sagacious savage; for there was needed a strong motive to call this complicated and difficult mental action into exercise: and it is even now to be observed that sagacity and sociability are not commonly united in high degrees even among civilized men. Growths both in the quantity and quality of the brain are, therefore, equally probable in the history of human development, with always a preponderance of the advantages which depend upon quantity. But the present superiority of the most civilized races, so far as it is independent of any external inheritance of arts, knowledges, and institutions, would appear to depend chiefly upon the *quality* of their brains, and upon characteristics belonging to their moral and emotional natures rather than the intellectual, since the intellectual acquisitions of civilization are more easily communicated by education to the savage than the refinements of its moral and emotional characteristics. Though all records and traces of this development are gone, and a wide gulf separates the lowest man from the highest brute animal, yet elements exist by which we may trace the succession of utilities and advantages that have determined the transition. The most essential are those of the social nature of man, involving mutual assistance in the struggle for existence. Instrumental to these are his mental powers, developed by his social nature, and by the reflective character of his brain's action into a general and common intelligence, instead of the specialized instincts and sagacities characteristic of other animals; and from these came language, and thence all the arts, knowledges, governments, traditions, all the external inheritances, which, reacting on his social nature, have induced the sentiments of morality, worship, and refinement; at which gazing as in a mirror he sees his past, and thinks it his future.

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