

ARTICLE II.

DARWINISM.

INTRODUCTORY.

The full title of Darwin's great work is as follows: "On the Origin of Species by Means of Natural Selection, or the Preservation of Favored Races in the Struggle for Existence."

The whole theme treated by the author is broader, than might be anticipated from the title. While the main force of the argument is expended in the attempt to prove the origination of new species by the gradual modification and differentiation of the offspring of a single species, the author by no means limits the range of the discussion, or the application of his theory, to that simple question. In the principles which he assumes or attempts to establish, in the wide range of facts and analogies which he adduces for proof or illustration, and in the beliefs unreservedly expressed, he covers the whole ground of the theory of the evolution of all existing organic forms from a few simple primitive forms of living existence.

He assumes, as he may legitimately do, that, if one species may diverge into several species, constituting a genus, then may genera diverge into families, and these into orders, and so on. He believes that such has been the history of organized beings on the earth, and anticipates that this view will be more and more confirmed as the knowledge of the organic remains of the past, and of the laws of life, as exhibited in the present, becomes more extensive and accurate. In the last pages of his book he throws out the supposition "that animals are descended from at most only four or five progenitors, and plants from an equal or less number."

While speaking of creation, as if not dissenting from the prevalent belief, as regards the origin of life, the author expressly declines to treat the subject as a question of science.

He also, in this connection, disparages the doctrine of spontaneous generation. For this he has been blamed by a critic in the "North American Review."

The critic admits, that, as Darwin's theme was the origin of species, and not the origin of life, he did not need to discuss the latter question at all, much less to adopt or reject any theory with regard to it. But he maintains, that, if Darwin adopted any opinion at all on the question, he was bound in consistency to accept the theory of the spontaneous evolution of life from inorganic matter, as the only doctrine at all compatible with his theory of the origin of species.

It must be admitted, moreover, that this theory of the origin of life naturally goes along with, and supplements Darwin's theory of the origin of species, and makes with it a consistent whole. If it could once be proved that life actually originates by spontaneous evolution from inorganic matter, and that species originate by evolution from pre-existing living forms, then might science plausibly claim to have marked for itself a plain path out of the supposed original nebulous chaos of our system, not only into the sublime order of astronomic law, but into the beautiful realm of life and conscious activity.

While Darwin is careful not to set up the claim of having actually proved anything beyond the probable origination of species by natural selection, many of his admirers are less cautious in this respect. Holding that the phenomena, which he passes in review, justify conclusions beyond what he claims, they eagerly seize upon his facts and methods as furnishing at least a provisional solution of the entire problem of living beings on the earth. By such, Darwin's work is valued less for what it proves, than for what it suggests,—less for the actual application of his theory to a wide but circumscribed range of facts, than for its supposed applicability to the entire field of facts and phenomena in regard to life on the earth.

Hence the work of Darwin presents itself to us under two aspects. The first has reference to what he has actually accomplished, or claims to have accomplished. The second regards the position which Darwinism occupies in the thought

and theory of scientific men of kindred pursuits. These two phases of the subject, combined, introduce a third of great interest and importance. I refer to the relation of Darwinism, reinforced by modern materialism, to the question of a personal Creator. I shall endeavor to treat these three points with such brevity as the importance of the subject will allow.

DARWINISM IN ITSELF CONSIDERED.

For a full understanding of the subject, it will be necessary to present a brief outline of the multitudinous facts brought forward by Darwin, and of the theory which he bases on those facts. In doing so, I shall not attempt to follow his order of discussion, or even to indicate all the arguments adduced by him, either as direct proof, or in answer to objections. Neither shall I limit myself to the precise facts presented by him, when other facts are at hand, which are better suited to the purposes of illustration.

The first thing which claims our attention in this connection, is the great law of inheritance, by which offspring resemble their parents in their general type and constitution, and often in their individual traits. The general facts covered by this law are too familiar to require specification or illustration at this point.

At first view these facts seem to be at war with the claim set up by Darwin's theory. This law, by which the characteristics of parents descend by inheritance to their offspring, does not seem to favor the theory which asserts the divergence of the descendants of the same pair into distinct species, and even into genera, orders, etc.

But it is to be observed that there is never a perfect resemblance of the offspring to their parents, nor of the individuals sprung from the same parents to each other. Hence, with the general inherited likeness of offspring to their parents, we as uniformly observe particular differences between parents and offspring, and the individual offspring themselves; so that it is not probable that any two plants or animals have ever

existed, which were exactly alike. This general class of facts has been designated by the term *variation*. Scientists hesitate, as well they may, to dignify variation by the name of law; for nothing could seemingly be more capricious in the manner of its occurrence, or more unaccountable, as regards any known law of causation.

Besides these slight variations of offspring from the type of the parents, there occasionally occur more marked variations, such as a supernumerary finger or toe. Of the same class are marked modifications of form and features, which occasionally make their appearance. A family is known to the writer, in which are several children with abnormally short and crooked limbs and a very peculiar cast of features,—in both respects entirely unlike either of the parents.

Now it is found that these unaccountable variations from the parent type usually descend to the offspring in the next and succeeding generations. A male child was born in the island of Malta, having on each hand six fingers including the thumb, and six toes on each foot. The family history of this individual has been traced down to his grandchildren inclusive. More than half of his descendants—who were not few—inherited his peculiarity of hands and feet. In 1791 there was born in Massachusetts a male lamb with very short bow legs and a very long body. The owner sagaciously propagated from him a new breed of sheep, called the otter breed. The peculiar merit of the stock was freedom from the vice of jumping fences. Accordingly the breed was much sought after by farmers, and thus propagated extensively over the State. Many other similar facts might be adduced.

Thus we have, first, the law of inheritance, or the general normal tendency of the offspring to copy the type of the parents; secondly, the general fact of more or less deviation in the offspring from the similitude of the parents, with occasionally a variation so marked as to constitute a seeming breach of the law of inheritance; and thirdly, we have the law of inheritance taking up and perpetuating through succeeding generations, not only the slighter variations, but also

any seemingly abnormal type that may intrude upon the line of descent. It should be observed, that Darwin makes but slight account of these marked and sudden variations from the parent stock, but bases his theory of the origin of species mainly on the observed facts of small variations gradually accumulated by selective breeding. Other advocates of the theory attach a higher degree of importance to these sudden variations.

Keeping in mind these general facts of variation and laws of transmission, we turn to consider what advantage man has taken of them for the modification or improvement of the domestic breeds of plants and animals. Darwin designates by the name of selective breeding the agency of man in this line of effort. This process has risen to the rank of a high art, and in some of its aspects it might be dignified by the name of science. It began with the selection, by the rude cultivator or herdsman, of his breeding stock for its more obvious external qualities, such as color, size, general form, vigor and activity. As men became more observant, they studied their breeding stock more closely, and thus were enabled to match individuals more intelligently and skillfully. It is said that scientific breeders often give weeks or months of study to the individuals from which they propose to propagate. In this way, by the perpetuation and gradual accumulation of those small differences which are daily observed between parents and their offspring, varieties are produced, which deviate widely from the original stock. This is accomplished without any extraordinary variation from one generation to the next. But when the breeder is surprised by some startling innovation, like that of the progenitor of the otter breed of sheep, he eagerly seizes upon it as the means of making a long leap in the progress of experiment, which he is interested to pursue.

Though these facts and principles are alike applicable to plants and animals, the most obvious and familiar illustrations of them are drawn from the animal kingdom. Thus Darwin selects the various breeds of domesticated pigeons, as the exam-

ple, par excellence, of what selective breeding can do, when aided by the tendency to variation, supplemented by the law of inheritance. He claims that the wild rock-pigeon is the well-known ancestor of all the domestic varieties; and yet that these descendants of a common ancestry have been brought, by selective breeding, to differ more from the parent stock and from each other, than do many well-recognized distinct species. These differences are said to extend, not only to superficial qualities, but to anatomical structure, and even to habits and instincts. The breeds of dogs and other domestic animals may be cited in illustration of the same principles.

With these illustrative facts and laws, we are prepared to pass from the barn-yard and farm to the theater of our entire globe, where the tendencies and laws of life have wrought on the scale of ages.

As we turn to wild nature, we find, in her living forms, the same tendencies to variation and the same laws of inheritance, with which we have become familiar in the domestic sphere. But we lack the agency of man to take advantage of those tendencies and laws by selective breeding. And here comes in Darwin's great principle of natural selection, to occupy on a wider scale the place held by selective breeding within narrower limits. That is, to use a personification, nature selects and breeds from those individuals, presented by variation, which are best adapted to the conditions of existence under which she nurtures and rears the various forms of life on earth. But the mode of her selection is widely different from that practiced by man. Nature is supposed to put the creatures of her care on a universal struggle for existence, in which she selects as her favorites only those which prove victorious in the conflict,—leaving the less fortunate contestants to perish in the struggle. But this theory of natural selection requires a more extended elucidation, in order to its complete understanding.

In addition to the well-known tendency to vary, which seems to be a constitutional characteristic of all living beings, Darwin recognizes the influence of climate, soil, quality and supply of food, etc., as causes of variation,—the changes pro-

duced by these causes being supposed to be perpetuated by hereditary descent. Whenever any one of the multiplied variations, which are sure to occur, fits the subject of it to succeed in the struggle for life, the fortunate individual survives the conflict and propagates his kind,—transmitting to his offspring the happy peculiarity which saved him from perishing, and which is to his descendants the guaranty of success in the contest to which they are born. The less favored varieties perish in the conflict, and leave their remains on the geological record of extinct species, while the survivors, according to Darwin's theory, go on by progressive changes to constitute new and distinct species.

The struggle for existence with plants is supposed to arise partly from external physical conditions of soil, climate, etc., partly from competition with other vegetable forms for root-hold, breathing-space and sunlight, and partly from the destructive agency of animals that feed upon them. Any change which gives one variety an advantage in any of these respects, will ensure its preservation and the propagation of its advantages to its posterity. In like manner with animals the struggle for existence arises, partly from the external physical conditions of climate, as affecting their vital constitution, and of soil and climate, as related to an adequate supply of food, partly from competition with other animals, which consume the same kind of food, and partly from the destructive agency of other animals, which feed upon them. A few illustrations will set the subject in a clear light. They will be taken from the animal kingdom, as more obvious and impressive.

Take, for illustration, the animals inhabiting a cold climate. It is plain that any variation,—as increased length or thickness of fur,—which would enable the favored varieties to bear intense cold better than others, would save them from casualties by which great numbers of the less fortunate varieties would perish. One excessively severe winter might clear a whole region of the more thinly-clad varieties, leaving the more favored races in undivided possession.

Turn now to a hot climate, and take, as an example, what

has been regarded as a plausible account of the origin of the black races of men. It is well known that the heat and malaria of many parts of Africa prove fatal to white men, while the blacks thrive in health and vigor in the same regions. Suppose now, that the continent of Africa was first settled by whites. The effect of the climate would soon be seen in a general darkening of the complexion of the inhabitants. Occasional spontaneous variations would bring out individuals of unusual darkness of hue. As the population should increase and spread into the more sickly regions, the individuals of pale complexion would sink under the deadly influence of the climate, while the dusky varieties would live on, multiply and fill the continent. Thus, through natural selection, or the survival of the fittest, we should have a black population of millions, descended from an originally white race.

It is unnecessary to go into all the particulars of natural selection, as set forth by Darwin. It comes into operation wherever a spot of earth becomes crowded with its living inhabitants,—where individuals and species must compete with each other for the means of subsistence. In such a contest, only the strongest and best would survive; and their advantages would, according to Darwin, be likely to depend on differences of structure and constitution, which had been gradually accumulated by natural selection.

Take, as another example of natural selection, the case of one race of animals, which is preyed upon by another, where swiftness of foot constitutes the only means of escape to the persecuted race. In such a case those varieties which are the best formed for speed will survive in larger proportion than others, while the slow-footed would largely fall a prey to their enemies. Thus a pack of wolves, operating on the race of deer, might prove as successful breeders and trainers for speed as the most eminent jockeys and lords of the turf.

Another mode of natural selection is appropriately named by Darwin sexual selection. This mode of selection operates mainly through the competition of males for the favor of the females,—the decision of the contest depending either on vic-

tory in single combat, or on the display of superior charms. Where the trial by combat decides the contest, it is obvious, that the strongest and best males will propagate the most numerous offspring. Darwin thinks, that, among birds, those males, which excel in brilliancy of plumage and melody of song, win the favor of the females, and that thus, in all probability, a gradual improvement has been wrought in the colors and singing qualities of the feathered tribes.

In reading Darwin's book, we are surprised and delighted at the astonishing richness and variety of facts, which he has brought to the support of his theory. We are instructed and charmed, as we trace with him far-reaching analogies, of which we before had but faint glimpses. We follow him with assent in many of his inferences and deductions. But are we able to admit, that he has successfully established his theory of the origin of species?

This question naturally divides itself into two. Has the author traced and substantiated by satisfactory proof the origin of any *one* new species by gradual divergence from a single parent stock? Or, failing in this, do his facts and arguments make it probable that species have thus originated by natural selection? — nay more — that this is the law of development, by which all the varieties of living existence have originated from a few simple primitive forms?

In order to answer the first question, it will be necessary to settle down upon some test of specific difference, by which we may decide whether two allied groups are distinct species, or only varieties of the same species. If differences in size and external form, slight diversities of anatomical structure, and some variety of disposition and habits, are to be accepted as tests, Darwin may claim that he has traced the origin of several distinct species of domestic pigeons from the wild rock-pigeon.

But the trial test of specific difference generally adopted by naturalists, is that of sterility or prolific breeding between two allied groups. If the male and female of two such groups, when mated together, either produce no offspring at all, or

produce a sterile offspring, the groups are ranked as distinct species. If, on the other hand, when the male and female of two allied groups are mated together, they breed freely, producing prolific offspring, which also breed without limit with each other or with either of the parent groups, the groups in question are ranked as varieties of one species.

Now it happens that Darwin's so-called species of pigeons all breed freely together, always producing prolific offspring, whose fecundity goes on indefinitely from generation to generation. And what is very curious, the mingling of currents, which have long been kept separate by selective breeding, brings out anew the parent variety of the rock-pigeon, as also other varieties not registered by the fanciers, but forms, which were probably dropped out of the series, in the selection of breeders during the progress of variation. Of course, those who adopt the test of sterility or fecundity, in the experiment of interbreeding between two groups, as decisive, will claim that Darwin's alleged species prove to be only varieties.

Darwin attempts to break the force of this argument by alleging some diversity in the degree of sterility revealed by the experiment of interbreeding between allied groups; thus aiming to make it appear that this supposed bar of sterility between species is no such iron law as had been assumed. His facts and arguments on this point are drawn almost exclusively from plants, and are, on that account, less applicable to the question at issue, which concerns the animal kingdom. He also complains of the arbitrariness of the assumption of the test of sterility, and exposes the alleged inconsistencies of those naturalists who profess to be governed by it. He charges them with first classing two allied groups as distinct species, on the basis of well-marked specific differences; but afterwards, when it is found that the two groups breed freely together, producing prolific offspring, they reconstruct their classification, as he affirms, ranking the two groups as varieties of one species. On the other hand, as he alleges, they will class together as varieties, groups which closely resemble each other, but anon will arbitrarily sunder them into distinct species, on finding that they will not breed together.

Absurd and inconsistent as this may seem from Darwin's stand-point, such naturalists are at least consistent in their adhesion to the standard which they recognize as authoritative in the case. Their procedure is also perfectly consistent with sound logic, as defined by the highest authorities in science. When the scientist has inferred a law, or recognized a class, on the basis of induction, and has gone further and decreed the consequences that would follow on the supposition that the induction is valid, he is logically bound to give up or modify the supposed law or class, if his deductions will not stand the test of verification. In the case before us, the test of sterility is appealed to, to verify or invalidate a classification based provisionally on external signs.

Still there remains the question at issue between Darwin and the majority of naturalists, whether the test of sterility is a legitimate standard of appeal for the verification of a given classification of species. From Darwin's point of view, the free interbreeding of forms so unlike as carriers, pouters, tumblers and fantails, is proof that sterility does not always stand as a bar to prevent the intercrossing of different species; while the same facts convince other naturalists that carriers, pouters, tumblers and fantails are of the same species, notwithstanding their marked difference in external form, habits and manners. The controversy, therefore, is over the propriety or validity of the sterility test of specific difference, as compared with morphological differences accurately ascertained by close and intelligent inspection. Both tests are of recognized validity when they are not in conflict with each other. We are called to decide which shall prevail when they conflict, as in the present instance.

It is easy to see that the test of exterior likeness or unlikeness is very vague and uncertain. Who shall decide what degree of unlikeness is compatible with retaining groups together as varieties of one species, and what degree shall require them to be separated, in classification, into distinct species? The decision is often very difficult—so difficult that experienced and skillful naturalists have often differed

from each other in their grouping of species and varieties. The sterility test, on the other hand, is certain and decisive, whenever it can be satisfactorily applied. It has also long exercised great authority with the best naturalists,—having often brought to agreement those who had disagreed with each other, in classifying, by the test of external difference or likeness.

But these advantages of the sterility test should not give it ascendancy, unless it is, in its very nature, in accord with the highest aim of classification in natural history, and with the profoundest laws of vitality.

What is the aim of the naturalist in his efforts to determine the boundaries of species? Is it simply to come to an agreement with other naturalists with regard to the application of a specific name, so that they shall understand each other as to what group of organic beings is meant when the name is called? This is one important aim of classification in natural history. But it is only secondary to the much higher aim of grouping together, under the same specific name, only those individuals and varieties which agree with each other in the most essential particulars of their interior constitution and vital endowments. Agreement in external characteristics is of importance in the eyes of the naturalist only as it indicates agreement in the interior constitution and vital functions. And such are the analogies of nature that these outward signs are not likely to mislead with regard to the functional endowments of the individuals and varieties compared. But agreement in the inward vital nature being the essential thing, and external likeness only the sign of such agreement, when the sign fails we have nothing to do but to fall back on that which is essential. Now the experiment of interbreeding applies the profoundest and most decisive test of agreement or disagreement in the essential vital nature of the groups compared. It is reasonable, therefore, to claim that those allied groups, which mingle their blood freely in the propagation of offspring, are of the same species, and that those, between which exists the barrier of sterility, belong to distinct species.

We therefore come to the conclusion, that the strange and eccentric breeds of pigeons, around which centers so much interest in Darwin's discussion, are not distinct species, but marvelously diverging varieties, which still retain, in some latent form, in the very constitution of their blood, the original traits of the race from which they are descended. The persistent unity of species of all these breeds of pigeons is shown by the wonderful outbreak of varieties arising from intercrossing,—these varieties copying not only the ancestral type, but developing many other peculiar forms, which are probably a repetition of the various modifications which have arisen through successive gradations of change, by which the most abnormal types have been reached.

This conclusion carries with it the decision of the question at issue; and the decision is, that Darwin has produced no well-authenticated instance of the origin of a new species by variation and selection from a pre-existing species. Taking the sterility test as the criterion, we may appeal to the authority of Huxley in support of the same conclusion. He says, "Darwin, in order to place his views beyond the reach of possible assault, ought to be able to demonstrate the possibility of developing from a particular stock by selective breeding two forms, which should not be able to cross one with another, or whose cross-bred offspring should be infertile with one another." As to whether this desideratum has yet been reached by Darwin, or any one else, Huxley goes on to remark, "I do not know, that there is a single fact which would justify any one in saying, that any degree of sterility has been observed between breeds absolutely known to have been produced by selective breeding from a common stock."

We come to the second question, whether Darwin, though unable to adduce a single authentic instance of the origin of a species by selective breeding, has yet been able to present plausible reasons for the belief, that the transformation of the descendants of a single pair into distinct species, has ever taken place in the past, is in progress in the present, and is likely to go on in all the future. It is the leading aim of Darwin's book to set forth reasons for such a belief.

Though Darwin's own belief, and the application which he makes of his theory, go much further than the assumed divergence of individuals into varieties, and of varieties into species, he wisely limits his main argument to the question of the origin of species; as this covers the whole ground of controversy between opposing parties. For if diverging varieties have never yet been able to break over the border line, which circumscribes species, they are not likely to achieve the feat of making the wider deviations into genera, families, orders, etc. But if, on the other hand, the descendants of a common stock may cross the nearest natural boundary, there is no good reason why they may not reach and successively pass over the remoter limits which have been supposed to divide organic beings.

As regards the nature and extent of the evidence on this question, Huxley remarks, "I do not know, that it is possible by direct evidence to prove the origin of a variety in nature, or to prove selective breeding." But as varieties within the limits of species are known to exist in the wild state, it is perfectly legitimate to ascribe their origin to the joint agency of the tendency to variation, observed in domestic species, and of any causes operative in nature, which may act a part analogous to that of selective breeding. Now it may be freely granted that Darwin, under the designation of natural selection, has called attention to the agency of causes of great potency, which obviously act in the manner and direction, which he ascribes to them. The only question is, are they adequate to perform the stupendous task, which he has set for them? He has satisfactorily accounted for the origin of varieties in the natural state by analogies drawn from domestic species, and by a most skillful and logical presentation of facts and arguments fully bearing out his conclusions. But is he entitled to go further and to claim, that species have originated like varieties through the agency of variability and natural selection? I think that impartial scientific criticism must decide that he has failed to establish the justice of such a claim.

It is but fair to admit, on the other hand, that a more indul-

gent criticism finds much in Darwin's book to charm the imagination and win the reason to the acceptance of the theory set forth. There is something fascinating in the thought of a unity in multiplicity, bound into oneness by the all-pervading ties of genealogical descent and unlimited correlation of kindred forms. This thought has a peculiar attraction for those persons, who are mentally averse to that conception of unity which rests in the originating and controlling power and providence of an omnipotent Creator. Moreover, the style and manner of the author is such as naturally to conciliate the favor of the reader. There is an evidently honest aim at candor, quite remarkable in an earnest and enthusiastic advocate of a theory. Then this very enthusiasm is adapted to catch the sympathy of the reader and to drift him unconsciously into the views of the author.

Of course the reader has seen, in what has gone before, that there is more in this book than the glamour of magnificent generalizations, the fascination of a pleasing style, and the charm of a pervading enthusiasm. Laying aside all these, we have still left a broad basis of solid facts, supporting a superstructure of plausible speculation and argument.

Darwin's theory of the origin of species derives its show of validity from the fact that it assumes no new or unknown law of nature, but is a simple attempt to generalize and to extend the application of actual known laws of organization — laws which cover a wide range of the most interesting facts of biology. The law of development, which lies at the basis of the hypothesis, is no fiction of superficial scientists. Within a certain range it exercises a supreme and rightful sway over the facts which relate to the origin and growth of organized beings.

From the first appearance of the individual plant or animal till the stage of maturity is reached, much of the progress of change which takes place falls under the law of evolution or development. In the case of the frog we have the same individual passing from the form of a limbless animal, with well-developed tail, to that of a tailless quadruped, and from the

condition of fish-life to that of an air-breathing animal. In many insects we have three well-marked stages of development, under the forms of larva, chrysalis, and perfect insect. In the facts of embryology we have another exemplification of the great law of organic development. Von Baer has shown that the embryo of a higher form of organization passes in its progress of development through all the grades of the lower forms; so that if, in the class of vertebrates, the embryo becomes capable of individual life at an early stage of development, it will come forth a fish; if it becomes self-supporting at the next higher stage of evolution, it takes its place in the rank of reptiles; in the next higher grade we have the bird; in the highest of all, the mammal. Geologists recognize a remarkable parallelism between the successive stages of embryonic development and the succession of organized beings on the earth, as indicated by fossil remains.

It is not strange that such facts and analogies should have suggested to naturalists the guess, that species, genera, orders, classes, etc., may have originated from some common stock, through the operation of the laws of development, which are known to have so wide an application to the phenomena of the organic world. Whether this guess is to stand as a simple hypothesis, or is to take rank as a confirmed theory, correctly representing the order of nature in that department of phenomena to which it relates, is the question at issue.

It is an argument much relied upon by the partisans of the theory in question, that it renders intelligible the great system of nature, while, as they allege, the doctrine of especial creative interpositions is glaringly inconsistent with the sublime order everywhere observed. Many facts brought to light by comparative anatomy are claimed to be intelligible on Darwin's theory, but are declared to be utterly without significance on the theory of creative design. Compare the bones of the limbs of animals, and you will find a remarkable similarity, in number, form and connection, running through the great majority of the species which have existed in the past or still exist in the present. In one species every bone, however

minute, constitutes an essential part of a perfect and highly useful organ. In other species many of the bones are seemingly useless, and at best but rude imitations of their analogues in the more perfect species. These facts are assumed to be intelligible on the theory of the transformation of species, the imperfect bones being supposed to be either rudimentary forms left unfinished by arrested development, or the degenerated parts of organs which have fallen into decay by disuse.

This argument assumes that phenomena become intelligible by being referred to a general class, for which they have a real or imaginary resemblance, whether they can be proved essentially to belong to that class or not. Moreover, the allegation, that such facts are intelligible on Darwin's theory, but inconsistent with the doctrine of a designing Creator, is based on the assumption that the Creator, if there be one, ought always to confine himself to serious work, and not indulge in the diversion of playing with analogies by sketching in many species a plan which he brings to perfection in only a few. Whatever man may be allowed to do for innocent amusement or for the gratification of an artistic sense, it is assumed to be unbecoming the dignity of a Creator to depart in the slightest degree from the most rigid rule of utility.

We shall best estimate the weight of the arguments adduced in support of Darwin's theory by applying to them the test of the inductive logic. The highest authorities on the philosophy of the inductive sciences specify three steps in the procedure by which a theory may be constructed and established as the true representation of the facts and laws of nature, as regards the phenomena to which it is applied. The three steps of procedure in question are induction, deduction and verification. By induction we first infer a law from the observation of a limited range of related facts, and then hypothetically extend the application of that law over all other seemingly allied facts. This extension provisionally raises the supposed law to the rank of a general theory. By deduction we proceed to offer explanations, based on the supposed law, of all related known facts—assume that observation will confirm the applica-

bility of the law to this wider range of phenomena to which it has been extended, and go on to predict, on the hypothetical validity of the law, other yet undiscovered facts. By verification we resort to experiment, observation and comparison, as the means of testing the validity of our deductions. If the tests confirm the deductions, so far, the theory is confirmed. If the tests fail, it is proof that there is some defect in the conception of the law, or that our induction has extended it beyond its legitimate range.

From a great multitude of organic phenomena, a law of evolution or development has been inferred, and, within certain limits, may be regarded as established. The theory of Darwin, by a bold induction, extends the application of this law to the supposed origination of all organic forms from a few primitive, simple forms, and assumes to set forth the conditions, physical and organic, through which such stupendous results have been accomplished.

Assuming the validity of this induction as a true representation of the facts of organization, the following are legitimate deductions from it:

1. By skillfully taking advantage of the tendency to variation and law of inheritance by selective breeding, we shall be able to bring about the transformations which the theory assumes to be constantly going on.

2. The theory will satisfactorily account for all organic phenomena at present known or yet to be discovered, as regards form, anatomical structure, instinct, habits, etc.

3. A closer observation of organic forms will show them imperceptibly graduating one into the other, without any distinct lines of demarcation between them; and this ought to be apparent, whether we direct our attention to the living races or to the remains of extinct forms.

4. The order of succession shown by organic remains ought to be from the simpler to the more complex, from the lower to the higher organic forms.

5. The geographical distribution of organic beings should conform to the genealogical relations, which the theory

assumes to exist and to run through all the ranks of living beings.

The validity of Darwin's theory stands or falls with the success or failure in verifying these deductions. If we now inquire how far the author has been able to establish his theory by a successful verification of the deductions legitimately drawn from it, we find that his appeal to facts encounters more difficulties requiring explanation than coincidences with anticipated results. Instead of the movement of verification being for his theory a triumphant march from conquest to conquest in the field of fact and analogy, it is rather a succession of encounters with almost insuperable difficulties, and of gigantic efforts to smooth them away. Hence this part of the author's discussion is largely made up of efforts to answer objections, and of ingenious searches for loopholes of escape from the pressure of obstinate facts. He finds more to do in trying to show that the facts which he encounters are not subversive of his theory, than in proving them confirmatory of it. Thus the attempt to estimate the weight of his arguments will have to deal rather with the validity of his answers to objections than with direct proofs in confirmation of the theory. In applying to his reasonings the appropriate tests of validity, it will not be necessary to follow strictly the order of the foregoing deductions, or that adopted by the author.

In the first place, if we take a general survey of the field of fact and analogy, which Darwin lays open to our view, we see changes going on, little by little, which seemingly fall in with the theory in question. Observing this progress of change, we can not say what degree of transformation might not be reached in the lapse of ages. If we take a nearer view, and follow out the history of a few cases of marked deviation from the parent type, we find ourselves still more inclined to give a respectful hearing to arguments in support of the theory. After witnessing the results of selective breeding in the case of pigeons, dogs and some other domestic animals, — witnessing the production of varieties more widely differing from each other in external appearance than do many distinct wild spe-

cies, it does not seem a violent assumption to suppose that the wild species, so nearly alike in external characteristics, may have originated by natural selection from a common parent stock. Nor is it strange that those who have followed the author's facts and reasonings with ready belief thus far, should resist the attempt to shake their conviction by an appeal to the test of interbreeding between the allied groups; yet, for reasons already stated, the application of this test seems to throw the preponderance of probability against the theory.

It being generally admitted, that there is no satisfactory proof of the *actual* origination of a species by selective breeding or by natural selection, the question turns on the bearing of the facts adduced on the *probability* of such origination of species. Let us turn again to the facts, and try to extract, if possible, their real meaning.

The author notices the fact of the unrestricted fecundity of the crosses of all the varieties of domestic pigeons, even of those which are the most diverse in external form and character; and he labors strenuously to break the force with which this fact bears against his theory. He also alludes to the diverse and almost anomalous character of the mongrel offspring of these crosses,—some of the young copying with minute accuracy the ancestral type of the wild rock-pigeon, some resembling one or the other of the immediate parents, and others, again, more or less unlike any existing varieties, but probably not inaccurate copies of the intermediate grades of variation between the parent stock and the latest and most diverging varieties.

Darwin seems not to have noticed the peculiar significance of the facts relating to the diverse character of the mongrel offspring of the different varieties of pigeons. To me these facts seem to prove the persistent identity of the type of the species through all the gradations of change to which it is subject,—that those varieties which diverge most widely from the parent species, still carry along with them a vital constitutional oneness with the original stock, and with the long line of ancestry, by which they have descended from it. The vital

tendencies, in which this oneness consists, may slumber long, but it is doubtful if they ever completely die out. So long as diverging varieties are bred strictly, each within its own line of descent, the hereditary force, accumulated by oft-repeated impulses in the same direction, is measurably certain to bring out in the offspring, perceptibly accurate copies of the immediate parents. But when two of these strong currents are made to cross each other, there seems to be a sudden uprising of latent vital tendencies, a re-awakening of long slumbering forces, bringing to the surface, not only the original type of the species, but a multitude of kindred forms, which may have appeared and vanished in the long line of descent.

It seems to me that this view of the facts is reasonable and just, and that it throws the balance of probability on the side of the doctrine of the stability of species,—this stability being secured within by the mysterious tendency, in all the varying forms, to treasure up and preserve in their very life-blood, all the characteristics of the variable type,—and being guarded without from the intrusion of allied species by the barrier of sterility.

[TO BE CONCLUDED IN OUR NEXT NUMBER.]

ARTICLE III.

MODERN EVANGELISTS AND SPÉCIAL EFFORTS TO CONVERT AND SAVE SINNERS.

The grand end of our Lord's mission into our world, and of his institution of the Church with its various ministry, was to convert and save as many as possible of our lost race. "And he gave some to be Apostles; and some, prophets; and some, evangelists; and some, pastors and teachers; unto the perfecting of the saints, for the work of ministration, for the building up of the body of Christ." He thus provided for the fulfillment in all following time of his commission to his disciples just before his ascension, that they should "go into all the world and preach the gospel to every creature," and

ARTICLE II.

DARWINISM.*

Let us pass on to notice other more positive objections to Darwin's theory—objections which he states fairly, and with great candor acknowledges their force. Yet he does not shrink from encountering the difficulties lying in his path. In his efforts to overcome them, he brings to his aid a vast array of facts and analogies, gathered from the whole range of organized beings, from the earliest traces of organic forms in the geological strata, to the swarming races which occupy the earth at the present time.

As already stated, Darwin does not meddle with the question of the origin of life on the earth. Supposing life to have already begun, far back in the past, in a few simple forms, he assumes for his theory the responsibility of accounting for all the forms and phenomena of life which have since come to light. He admits that one single authentic fact, which is in conflict with his theory, or does not admit of a plausible explanation in accordance with it, is fatal to its acceptance.

One of the difficult facts, requiring explanation, consists in the extreme complication and high perfection of some of the organs of living beings, such complication and perfection as seemingly to surpass the power of gradual variation, natural selection, and hereditary propagation, to elaborate and perfect them. The wing of the bat is one of the organs which presents this difficulty. The bat, in all other parts of its organization, is allied to the mole, shrew, and other small insect-eating animals. Hence, according to the theory of natural selection, its wing must have been developed from the paw of some shrew-like congener. How this could be done is the problem to be solved by the theory. Darwin encounters this difficulty by adducing a few cases, which he regards as repre-

* Concluded from May No.

sending the progressive stages of transition from naked paws to the perfected wing. For illustration, take the habit of leaping from branch to branch, and from tree to tree, so common with squirrels and monkeys. It is supposable, according to Darwin, that by some fortunate variation, individuals of these races should be born with a slightly developed fold of skin along the sides, between the anterior and posterior extremities. This, in their usual outspread manner of making their passage through the air, would buoy them up and give them a decided advantage over others in the habit of leaping. Natural selection, progressive variation, and the law of inheritance, according to the theory, would increase and perpetuate this peculiarity, until any supposable degree of perfection in the organ might be reached. The parachutes of the flying squirrel and of the flying lemur are spoken of as marking possible gradations in this line of development.

After giving all due weight to the above explanation, it seems to me that an unbiased judgment must pronounce it unsatisfactory. It gives us no instances of even probable transition forms between the paw and the wing; which forms ought to exist, if such changes have taken place in the past and are going on in the present. Then the anatomy of the bat's wing reveals a seeming skillfulness of adaptation, which quite lifts it out of the realm of chance and change, over which natural selection and the law of inheritance are supposed to reign.

The eye is another organ which receives attention in this connection. This difficulty is passed over—a very confident opponent would say, slurred over—by referring to supposed stages of development of this organ, from the eyeless inhabitants of caves and the rudimentary eye of the mole, to the most perfect state of the organ in the higher animals. Is it uncandid to say that this looks more like a subterfuge than an explanation? Besides, it ignores the fact that there is, in all complicated organs, more which requires explanation than their simple constituent and structural composition and form as mere material masses. But this will come up for more extended notice further on.

As may have been already anticipated, another difficulty in the way of the theory arises from the wonderful instincts of animals—instincts correlated to the degree of perfection of the organization, and often surpassing in results the highest wisdom and art of man. If the existing forms of life have been developed, by variation, natural selection, and inheritance, from lower and simpler forms, then new instincts must have come in to adjust the relations of the improved being to its higher sphere of life; and the new instincts must accurately correspond with the improved state of the organization.

The author meets this difficulty by first setting forth an analogy, or, as he would have us think, an identity between habit and instinct, and then adduces cases of instincts varying with the external conditions of existence—such variations being supposed to be steps in the progress of acquiring new instincts. Some of the instances of variable instincts adduced by the author are that of woodpeckers, which seek their food in the ground; that of land animals, inhabiting water coasts, seeking their food in the water, while usually living exclusively on the land, and other analogous cases. It is safe to leave the reader to judge how far such arguments go in explaining the cell-building instincts of the bee, the domestic economy of the hive, and the analogous facts as regards the internal polity of families of ants.

One of the most formidable obstacles in the way of the acceptance of Darwin's theory, is the existence of the neuter class of insects among ants and bees. As the neutral sex imposes sterility, this form of variation, with its wonderful development of the instincts of industry and skill, can not have been propagated by direct inheritance. The solution of this difficulty, offered by Darwin, does not seem quite satisfactory. It makes the supposition that certain parent bees or ants produce, as an occasional variation, a proportion of sterile offspring, which greatly surpass the parents in skillful industry for the benefit of the community. It supposes that the communities in which this variation occurs thereby become prosperous, and thus gain an advantage, in the struggle for existence,

over less fortunate communities. Hence, it would follow that those males and females which are endowed with the capability of propagating multitudinous neuters, would multiply more rapidly than others, and the peculiar variation would go on till the relative numbers of neutral and sexual offspring would be adjusted to the wants of the communities respectively.

As regards this solution of the difficulty in question, it is sufficient to say that the supposed changes are not known ever to have occurred in the past, or to be going on in the present. Moreover, it assumes so many things which, if true, would be quite as hard to explain as the original difficulty, that we are compelled to believe that the problem still waits for a solution.

Another difficulty grows out of the observed geographical distribution of plants and animals. Regions which are separated by wide oceans, lofty and continuous mountain barriers, or by the interlocation of a tropical climate, present but few closely allied forms in common. This is not inconsistent with Darwin's theory, as the ancestral types of living forms are supposed to have originated far back in time, when the relations between land and water, mountain and plain, heat and cold, were very different from what they are at present. The diverging descendants of the primitive types, being separated by the upheaval of mountains and the subsidence of land, giving rise to oceans, would go on diverging, under different conditions of existence, becoming more and more unlike. The general facts of geographical distribution, as already suggested, agree with this hypothesis. But there are some identical, and many closely allied species found on opposite sides of wide oceans and lofty mountain ranges, and in northern and southern hemispheres, with an incompatible tropical climate between them.

If the general diversity of forms, in widely distant regions, is accounted for by long separation, what shall we do with the particular cases of similarity and identity? Darwin replies by suggesting possible modes of migration between divided regions. He supposes the communication between the northern and southern hemispheres to have been effected by two

alternating glacial periods on the two sides of the equator. The author's suggestions under this head can hardly take a higher rank than that of plausible guesses, and therefore can not be accepted as a solution of the difficulty in question. Yet they are deeply interesting and instructive, apart from their bearing on his theory.

Again, if existing living forms have descended, or, rather, ascended, from a few, simple, primitive types, by a slow and scarcely perceptible progress of variation, the geological strata ought to have preserved the remains, not of distinct species, but of a continuous series of forms, running into each other by imperceptible gradations, so that any two forms separated by distinct specific differences, should have, lying between them, other intermediate forms, insensibly graduating into the two species and into each other. Now, Darwin freely admits that the geological record, as far as it has been consulted, testifies to the succession of distinct species, in the absence of intermediate forms. He endeavors to break the force of this objection by first showing the general agreement of the geological record with his theory, and then attempting to account for the particular disagreement by proving that the geological record is too imperfect to be relied upon to sustain the objection.

The general agreement of the facts of geology with Darwin's theory may be thus stated: First, the fossil remains of extinct races show a general progress, in the order of time, from the lower to the higher organic forms. Then, if we take three successive geological formations, naming them A, B and C, from below upward, we shall find that the fossil remains of A are more closely allied to those of B than to those of C, and that those of B are intermediate in form between those of A and C. This holds true, though there may be no identical species connecting the three formations. But the knotty fact for Darwin's theory is, that the transitions are made by leaps from one species to another, and not by an imperceptible gliding of forms into each other, as the theory requires. Darwin seems to be aware that his efforts to adduce a few intermediate

forms are not quite successful, and he falls back, in the end, on the imperfection of the geological record.

Once more, geology not infrequently reveals the sudden appearance and wide-spread prevalence of a new species in formations, in which they had not before existed. This fact, unless its force can be broken by other facts or by cogent arguments, stands in glaring violation, I had almost said contempt of Darwin's theory. The author meets this fact with supposed or imaginary migrations; and in the absence of any clue to the regions from which the new species may have migrated, he again falls back on the imperfections of the geological record.

In conclusion, under this head, what shall we say to the question how far Darwin has succeeded in establishing his theory on a basis of probability?

For myself, I would say, the general drift of the facts and analogies adduced by him is such as to lend a certain plausibility to the theory, while, on the other hand, it seems to me to fail in the encounter with almost all the trial tests of its validity. I think it is confronted, at the present stage of scientific knowledge, by more than one *experimentum crucis*, before which it will have to wait long before it can assert its claim to general acceptance. To bring the theory to the standard of the inductive logic, it may be said that the steps of induction and deduction have been duly taken, and appropriately elaborated; but attempts at verification have been almost uniformly failures.

Darwin, himself, seems to be conscious of his doubtful success in meeting and removing the objections to his theory. He says: "Indeed it will be thought that I have an overweening confidence in the principle of natural selection, when I do not admit that such wonderful and well-established facts at once annihilate the theory." Again, with regard to the case of neuter insects, he says: "I must confess that, with all my faith in natural selection, I should never have anticipated that this could have been efficient to so high a degree, had not the case of neuter insects convinced me of the fact." One can hardly

forbear a smile at the simplicity of this remark, which reveals at once the spirit of candor and the extreme bias of the author. The facts, which convince him of the wonderful efficiency of the principle of natural selection, will stand, to the majority of thinking minds, as irrefragable objections to his theory, unless more satisfactory explanations of them can be given than any to be found in his book.

DARWINISM IN ITS RELATIONS TO THE MATERIALISTIC TENDENCIES OF THE DAY.

Though *we* may decide that the theory of natural selection is not sustained by the facts and arguments adduced in its support, not such will be the decision of a large number of the most active minds of our age. Those who approach the question exclusively on the side of material facts and laws, will be almost sure to agree with Darwin; while those who encounter the theory mainly in those deductions which seemingly conflict with long-cherished beliefs, will, as certainly, disagree with him.

But a question of deeper interest is this: What is to be the effect of Darwin's theory on the thought of the present and succeeding generations? I can not resist the conviction that its influence is destined to be profound, far-reaching and controlling. It apparently harmonizes so many facts, and plausibly accounts for so many observed relations; it so falls in with a phase of speculation which is older than Aristotle, and has not been without partisans from that time to this; it apparently bridges so many sloughs of despond and levels so many hills of difficulty for many minds which have long been aching to find their way from inorganic matter, through mere molecular forces, up to the highest manifestations of life, that it can not fail to draw to its investigation and support an important share of the mental activity which is at work at the solution of the great problems of existence.

This brings up the question of the precise relation of Darwin's system to the skeptical philosophy of the day.

This philosophy holds, and is ransacking every corner of the earth, every nook of the ocean-depths, and the records of the ages, stored up in the geological strata, to prove that all organized beings have sprung out of unorganized matter through the action of the mere material forces with which it is endowed. This is not Darwin's doctrine. He expresses the opinion that "life, with its several powers, was originally breathed by the Creator into a few forms, or into one, and that from so simple a beginning, endless forms, most beautiful and most wonderful, have been and are being evolved." The material philosophy would substitute a supposed life-producing agency of the molecular forces of matter for the original inbreathing of life by the Creator, spoken of by our author. Having accomplished this long leap at the outset, the materialist is content make the remainder of the journey with Darwin. This is the relation of Darwinism to modern materialism.

To present a complete view of the subject in hand, it is important to inquire how the materialist proposes to pass over the gulf of gulfs which divides non-living from living matter, — utter passivity and blank insensibility from active, conscious life.

In the first place, there is a certain chemical compound, believed to be an essential constituent of all living beings, and which is not known ever to have been produced outside of living organs. This compound is called protein, and is composed of carbon, oxygen, hydrogen and nitrogen. With the addition of very small proportions of sulphur and phosphorus, it constitutes the principal basis of the living tissues in animals, and is an omnipresent vital product in plants. Of its importance to life, Mulder, one of the highest authorities in organic chemistry, thus speaks: "It is unquestionably the most important of all known substances in the organic kingdom. Without it, no life appears possible on our planet. Through its means the chief phenomena of life are produced."

This substance is supposed to be formed in the vital organs, by the action of carbonic acid, water and ammonia on each other. The problem is, how to compound this important sub-

stance, as a preliminary step to organization, without the aid of pre-existing vitality. Concerning the task which the materialist sets for himself, and his hopes and expectations of success, take the following statement of Huxley: "To enable us to say that we know anything about the experimental origination of organization and life, the investigator ought to be able to take inorganic matters, such as carbonic acid, water, ammonia, and the salines, in any sort of inorganic combination, and be able to build them up into protein matter, and that protein matter ought to begin to live in an organic form. *That*, nobody has done, as yet, and I suspect that it will be a long while before any body does do it. But the thing is by no means as impossible as it now looks, for the researches of modern chemistry have shown us the finger-post pointing to the road that may lead to it."

Such were the views of Huxley in 1860. Since that time there has been no abatement of the active quest in pursuit of the great secret. All over the scientific world, eager eyes are searching, and skillful hands are manipulating, in hope of witnessing the formation of protein,—the first important step towards the origination of organic life from lifeless matter. The hopes of success which inspire these efforts are based on successes already achieved in the production of other so-called organic compounds.

One of the most marked examples of success in this line is the production of urea, by combining together cyanic acid and ammonia. Urea is found dissolved in the urine, and for a long time it was thought to be impossible to produce it by any combination effected outside of the living organs. The success of chemists in compounding this substance out of inorganic materials has encouraged them to hope for like success in producing such higher organic compounds as protein. We may better judge how far chemists are entitled to take encouragement from this success, by considering the rank of urea among other organic compounds.

Urea is universally regarded as one of the products of the first stages of decay of the waste materials of the organs, or of

superfluous nutrient matter in the system. Hence, it is only indirectly a product of the vital organs. Directly, it is the result of the decadence of real vital products. In this respect it agrees with carbonic acid and ammonia; except that it is the result of the first stage of decay, while they are the products of the last stage. Here is a distinction between urea and protein, so broad that it does not seem to me quite safe to reason very confidently from success in compounding the one from inorganic materials to a probable like success in compounding the other. So that we can hardly say, so far as chemical composition is concerned, that much progress has been made towards passing from lifeless to living matter.

With regard to the second step in the progress laid down by Huxley, that "the protein matter shall begin to live in an organic form," some alleged cases of spontaneous generation constitute the only facts which deserve a moment's consideration. It should be observed, in this connection, that the advocates of spontaneous generation do not claim to have ever witnessed the origination of living organisms from strictly inorganic matter. No one pretends that pure water, either alone or combined with other inorganic substances, and cut off from all access of organic particles, or organic germs, ever shows the slightest sign of life, in any form. It is only when water moistens, or holds in solution, some vegetable or animal substance that it develops a coating of mould, or swarms with animalculæ. So that, if we admit the claim set up for spontaneous generation, we do not have life springing out of inorganic matter, but a new form of life, superinduced upon matter which has already lived, and still retains the composition and constitution which it owes to pre-existing living organisms. A book has been recently published, entitled, "The Beginnings of Life." The previously published experiments of the author show that he only claims to have succeeded in breeding certain minute organisms from solutions or infusions of organic matter, after having made certain the impossibility of the presence of organic germs. Therefore, if the success of the author is all that he claims, there must have been a beginning of life before his beginnings, to prepare the organic mate-

rials used in his experiments. But the experiments of Pasteur, and the recently expressed judgment of Huxley cast serious doubts on the validity of the claim to even this equivocal success of engendering the very lowest forms of life from matter which had already been lifted out of the inorganic realm by pre-existing and higher forms of life.

It is but fair to state, that the question of spontaneous generation, as above defined, is still in dispute between men of science, who have devoted attention and labor to the subject. For some years the experiments of Pasteur were regarded as having finally settled the question against every form of spontaneous generation. Recent experiments by Dr. Bastian have led him to question the validity of the conclusions, drawn from the experiments of Pasteur. Huxley, who not only looks favorably but hopefully on efforts to trace the origin of living forms from inorganic matter, gives his judgment on the side of Pasteur. With the uniform results, in the same direction, of the numerous, ingenious, and carefully prepared experiments of Pasteur, and with the corresponding results of the millions of like experiments made every year in the process of canning vegetable and animal products, Huxley very naturally concludes, that the few cases of apparent exception to the general rule are more likely to be instances of failure to destroy or exclude organic germs from the infusions used, than of the generation of living organisms in the absence of such germs.

But whichever party to this controversy may prevail, we have, in either case, failed as yet to find any continuous path, by which inorganic matter makes the transition to the constituency of living forms, unaided by pre-existing life. Thus the materialist has not yet found the beginnings of the branching lines of Darwinian succession,—the rudimentary forms, from which variation, natural selection, and hereditary succession are supposed to have evolved all living existences on the earth.*

* The progress of discovery since the above was written tends to invalidate the claim of Dr. Bastian, to have witnessed the generation of organic life apart from the presence of living germs.

The programme of the materialist is all very simple. It is only the chemical combination of carbon, oxygen, hydrogen, and nitrogen in the form of protein,—then the addition of slight traces of sulphur and phosphorus,—then the compound “beginning to live” as “protoplasm,” soon taking on the form of a nucleated cell; then cell-multiplication, till a rudimentary plant or animal is produced; then Darwinism carried out in practice,—and we have standing before us in all their perfection the winning beauty, the sublime harmony, and transcendent mystery of the organic kingdom,—all evolved from dead matter through the agency of the molecular forces, with which it is endowed. But there is a slight obstacle to implicit faith in the reality of this beautiful scheme of things. As a matter of science, it remains unproved in all its parts and particulars; and as far as the evidence goes, the creative power in nature utterly refuses to adopt its rules in shaping plans or working out processes.

DARWINISM, AS SUPPLEMENTED BY MATERIALISM IN ITS BEARING
ON THE QUESTION OF A PERSONAL CREATOR.

The reader will have observed the bearing of the foregoing on the question at issue between theism and atheism. Though Darwin distinctly recognizes an original creation by divine interposition, materialists, who accept his theory, do not admit the necessity of such interposition, to account for the observed forms of existence. They cling to the belief that the molecules of matter, in their very nature, possess a life-producing power, adequate to originate all living forms, without the aid of personal, intelligent agency. It is true, that they fail at all points to make good this assumption by an appeal to facts, and can only claim at best, in the language of the cautious Huxley, “to have shown the finger-post, pointing to the road, that may lead to” a verification of their deductions. With what has gone before, the reader may be safely left to judge of the reliability of this finger-post, which, standing on no road, only points toward one, which road, when found, will lead some

whither, and *may* lead to the longed-for discovery of creation without a Creator.

But suppose that future discoveries of the powers of matter should bridge the chasm between the organic and the inorganic, would this necessarily land us in blank materialism,—and its natural result, atheism? Should the materialist successfully achieve his wish and aim in the matter of scientific discovery, would this leave us without God in the world? It might modify our views of the mode in which intelligent agency acts, but it could never shake our belief in the reality of such agency. Yet atheism assumes that it is one great mission of science, to banish this belief from the human mind.

Accordingly, those scientists, who were already committed to materialistic views, hailed with enthusiasm the appearance of Darwin's work, as the dawn of scientific atheism. Such persons, going beyond Darwin's aim or intention, value his theory mainly for the relief, as they say, which it brings to mankind, from the superstition of a Deity. C. L. Brace, in the "North American Review," names several distinguished men of science in Germany who accept this theory as a full and sufficient substitute for the belief in an intelligent Creator,—and who dwell with undisguised satisfaction on the great service, as they assume, of Darwin's theory in removing from the theory of the universe the necessity of a personal Creator.

Two fallacious assumptions lie at the basis of the so-called scientific atheism. The first is, that to ascertain and clearly state the formal law, or the observed order of a class of phenomena, is a full and sufficient explanation of those phenomena. The other is, that the idea of a personal agency at work in the movements of nature, is at war with the idea of law. The first fallacy makes little or no account of cause; the second assumes, that personal agency in nature is equivalent to fitful and capricious intermeddling with established order.

Of those who fall into the first fallacy, some ignore or reject cause altogether, as non-existent, or lying outside of positive knowledge. Others seemingly ascribe causal power to law,—

speaking of phenomena as the result of law;—as if a law were endowed with a certain efficiency, instead of being, as it really is, only a name for the observed order of phenomena, expressed in appropriate words. Both parties agree in regarding the idea of personal agency in nature, and that of the sway of law, as incompatible with each other. Thus Comte supposes that he has satisfactorily proved the doctrine of atheism, when he has appealed to the prediction of eclipses, as an illustration of the perfection of astronomic order. He assumes, that if there were a Deity, who could touch the solar system with intermeddling fingers, disorder would certainly ensue, and no one could tell what astronomical wonder might or might not occur at any moment. At such philosophical presumption we can almost fancy the Sovereign One looking down with amused compassion, and saying, “Thou thoughtest that I was altogether such an one as thyself.”

But in order to estimate the deductions of atheism at their true value, it will be necessary to call attention to a most important class of facts, the significance of which scientists very generally ignore, sometimes slur over, or occasionally recognize with a sidelong sneer. These facts may be more briefly and intelligibly presented by first bringing into notice the ruling idea, which runs through them, and harmonizes them into a consistent unity.

The ruling idea, which runs through all the ranks of organized beings, and makes of them one family, in a higher sense than that of Darwin's assumed law of genealogical descent, is implied in the very word organ,—instrument, in its original signification. The parts of a living being are not merely parts, but instruments subserving important uses for the advantage of the whole. Lop off or destroy any of these parts, and you have not merely marred a form—you have suspended a power, and entailed loss and damage on the being thus mutilated. The ruling idea, then, which runs through all the grades of organization, is the subserviency of means to ends, or of instruments to uses. This idea is equally applicable to the simplest organic forms and structures, and to the

most complicated organisms, in which many and diverse instruments perform tasks equally diverse, and yet work together on a system so delicately adjusted, that they are enabled to co-operate in the production of the most beneficent results.

Here is an important class of facts to be accounted for, — or, to use a favorite expression of Darwin and Huxley, — to be made intelligible, — facts which they have but slightly noticed, and have failed to explain, either by the laws of molecular forces or the theory of natural selection. If it be supposable that molecular forces are adequate to do anything and everything in the way of compounding matter, and shaping it into all conceivable structures and forms, are they equally capable of forecasting and planning the different uses of these diverse structures and forms?

It may be that the progress of knowledge, since the days of Solomon, has rendered somewhat less puzzling the question, “how the bones do grow in the womb of her that is with child?” — but how, in a higher sense, does a germinal vesicle, with scarcely distinguishable parts, grow in accordance with a definite plan, — gradually evolving heart, lungs, digestive apparatus, bony frame, muscles, brain, nerves, and organs of sense? I do not ask whether molecular forces might not have shaped any or all of these organs and structures, as mere material forms. I do not know why molecular forces may not shape an eye, as well as a crystal. I only know, that, as a matter of observation, they never have done it, without the aid of pre-existing life. It is not, that such a mass of matter as the eye, might not supposably be shaped by the action of material forces. The thing to be explained is, that, in form, structure, and composition, the growth of the eye is executing a plan, looking to a future result of the most marvelous significance. Or rather, passing from the eye to the entire system of organs, the wonderful fact to be made intelligible is this, that the little germinal vesicle should assume the task of evolving a *system*, embracing many and diverse organs or instruments, so connected and correlated as to co-operate har-

moniously in a circle of functions, in which each is reciprocally helpful to every other, — that these organs should grow up together in secret, many of them having no relation to existing conditions, but wonderfully providential, as preparatory for new conditions to be encountered at birth, — that this system of organs thus elaborated in darkness, should come forth to the light, a living, acting, conscious creature, ere long to be filled and thrilled with wonder at the mystery of its own existence, — that this wonderful being, on entering upon its new relations, should be found to fit, at a thousand points, into a pre-existing system, with a perfection almost surpassing conception. Such are some of the facts, which the researches of modern scientists have not yet succeeded in making quite intelligible, either by discoveries, as regards the laws of molecular action, or the results of natural selection.

With such a problem waiting for solution, we look in vain to material forces and laws for the key that shall unlock the secret. Such flashes of intelligence, foresight, plan, do not originate with the molecules of matter; and vain is the search that looks no higher for their cause. With eyes bent to the ground, intently prying into the secrets of matter, we ask, “Where shall wisdom be found, and where is the place of understanding? The depth saith it is not in me. The sea saith it is not with me.” Earth, air, time, and space, each in turn echoes back the response, “it is not in me.” A voice of loftier tone and deeper import seems to rise on the ensuing silence, “Why seek ye the living among the dead? Look into your own conscious being for the facts and analogies, which shall suggest a rational solution of the great problem of living nature.”

This brings us face to face with the almost universal recognition of an intelligent Creator, as the only adequate cause of the phenomena, to which especial attention has been called above. Even those who carefully exclude the idea of a Creator from all departments of scientific research, do not wholly escape the contagion of the prevailing conviction. Thus Huxley, in speaking of the evolution of the perfect

animal, with its complex structure, from the almost structureless germ, says the process goes on "as if there were an artificer at work at each" of the organs and parts. Again he speaks of the evolution of the ovum of the salamander or newt as "like the shaping of a lump of clay by a skilled modeller, — as if a hidden artist were striving with skillful manipulation to perfect his work."

One can hardly understand why the man who unconsciously drops such hints and suggestions all along the path of scientific inquiry, should be averse to the recognition of an intelligent Creator, as a cause falling appropriately within the domain of science. If the facts of organization, both in processes and results, are such as they might be, if planned and executed by a skillful artificer, why not believe that they have been planned and executed by a skillful artificer? Why not believe that there exists, apart from matter, or immanent in, and working through matter, a great conscious, planning mind, with skill and power adequate to devise and execute all the wonderful systems of living mechanism, which meet us everywhere throughout the organic kingdoms?

But it is not enough to call attention to the prevailing belief in a personal Creator, or to show that the elements of that belief haunt the minds of scientific men, who seemingly reject it. We ought to be able to show that the induction which eventuates in this belief is in accord with the most legitimate scientific procedure, and justified by the facts in the case. In attempting to show this, we do not argue for the existence of a Creator from the phenomena of organization. We take those phenomena as we find them in nature, and among all known and possible causes we seek for that one which will adequately account for them. The procedure is the reverse of the so-called argument from final causes; which latter form of argument is sometimes objected to as unphilosophical. It would be more correct to say that it is unscientific. Though perfectly legitimate as corroborative of an existing belief, it is unscientific, as not constituting a homogeneous element in any particular body of science. Let it be understood, then, that I am

not using the argument from final causes, but trying to make intelligible facts of the greatest moment and of the most surpassing interest. I am not trying to prove the existence of a personal Creator; I am trying to find an adequate reason for the existence of facts everywhere known and recognized.

If we now enquire for the legitimate scientific mode of searching for that reason, we shall find it in connection with the principle of analogy. Analogy supplies the basis of the logical artifice applicable to the case. The dictum of analogical reasoning, which is of universal application, is this: Things which agree in essential particulars in which they have been compared, are likely to agree in other related particulars in which they have not yet been compared. Thus, guided by analogy, we spread the results of a limited range of observation over a wider field of related phenomena. Then, following the clue afforded by analogy, we enter that wider field in search of the anticipated agreements. In proportion as our anticipations are realized, the deductions based upon analogy are confirmed, and we acquire a confident belief in other agreements which lie beyond the reach of direct comparison.

The application of this principle to the phenomena of organization will be better understood and estimated if we take along with us a parallel case of the application of the same principle in the inorganic world. I refer to the alleged discovery of the physical constitution and, to some extent, the chemical composition of the sun, fixed stars, and nebulae, by the aid of analogies brought to light by the spectroscope. This instrument discloses certain spectral phenomena of the light emitted by white-hot solids and liquids, as also the unlike phenomena of the light of flames, luminous gases, or vapors variously colored. It also brings to view a wonderful series of related phenomena, by testing the light from a white-hot solid or liquid after it has passed through flame or, which is the same thing, luminous gas or vapor. Every known material element is found to exhibit phenomena peculiar to itself; so that the application of the spectroscope has come to be recognized as the most delicate of all chemical tests. The application of this

test to the light of the sun, fixed stars, and nebulæ is supposed to reveal to us many important facts as regards their physical constitution and chemical composition. The validity of these inductions is based wholly on the observed analogies between the spectral phenomena of these celestial bodies and those of terrestrial matter. Since these bodies agree with terrestrial matter in exhibiting certain spectral phenomena, it is assumed without hesitation that they agree with it in those conditions of composition and constitution, without which the like phenomena are never observed at the earth's surface.

Thus the application of the spectroscope is assumed to have added the following facts to the body of our scientific knowledge of the heavenly bodies :

1. The body of the sun consists of a solid or liquid mass in a state of intense heat.

2. This central hot mass is surrounded with an atmosphere of luminous gas or vapor, called its photosphere.

3. Many material elements belonging to our earth enter into the constitution of the photosphere of the sun.

4. Many of the fixed stars are constituted like the sun, each consisting of a white-hot central mass, surrounded by a photosphere, which contains many terrestrial elements — some not found in the photosphere of the sun.

5. The nebulæ — even those which are resolvable by powerful telescopes — consist of luminous gases or vapors, since they exhibit the spectral phenomena peculiar to flame, and not those which characterize the unmodified light from white-hot solids or liquids.

To these truly logical, yet bold inductions, I have yet to learn of the first word of objection from any quarter of the scientific world. Let us see how the matter stands as regards the application of the same principle of analogy to the characteristic phenomena of the organic world, as set forth above.

It should be borne in mind that the essentially characteristic phenomena of living organisms are not the forms, structure, and connection of parts, in themselves considered; nor simply the formal laws of succession, by which generations

follow each other in lines of genealogical descent. The subserviency of means to ends, of instruments to uses; the co-operation of numerous organs in an intelligible system of order; these are the ruling facts of organization, which need to be accounted for. Let molecular forces do everything in the way of constructing and shaping forms, if they can. What we most need to know is, why these forms are not merely forms, but instruments wonderfully adapted to specific uses; why these instruments are put together on an intelligible plan, not having for its basis mere symmetry of form, but an orderly co-operation in a marvellous series of actions, running on through years. It is the subserviency of instruments to uses, and not the material forms of those instruments, that here requires explanation. It is the origin of the plan of the structure, and not the shaping of the materials which enter into its construction, that needs to be made intelligible.

We have only to follow to their legitimate results analogies which daily observation and experience lay in our path, in order to find a satisfactory solution of the problem of organization. All the works of man, to a greater or less extent, are examples of the combination of means for the attainment of ends; of the adaptation of instruments to specific uses. As a matter of observation and experience, we know these works to be the productions of intelligent personal agents. As a matter of intuitive reason we know that it is impossible that they should have originated from any other source. We know intuitively that an intelligent personal agent is the only adequate cause of plan and system in combining means for the attainment of ends.

We find the same law of adaptation of means to ends running through all the ranks and forms of organization. Analogy compels us in like manner to ascribe their origin to the only conceivable cause,—intelligent agency. Organized living forms agree with the works of man in being modeled in accordance with the law of intelligent adaptation; therefore logical consistency forces us to accept the belief that they agree with those works in being the products of intelligent

agency. The analogical argument which compels this belief is more cogent than most of the like arguments, which win the ready assent of scientific men, as regards the phenomena of the inorganic world. If the alleged revelations of the spectroscope may be allowed to pass unquestioned into the belief of the scientific world, why this insurrection of science, in the form of materialism, against the belief in a personal Creator? — a belief which rests on a basis of rational validity, at least, equally firm. Unless all that we hear about the constitution of the mass of the sun, the constitution and composition of its photosphere, is a sham and a delusion, having no foundation in fact, then is the existence of an infinitely-wise, all-powerful, personal Creator the mightiest fact of the universe. I say *personal*, for only a person can plan, select, devise, with intelligent aim. The god of the pantheist will not do. To endow matter with omnipresent, orderly-acting powers, — to try to bind the material universe into a harmonious unity under the name of Pan, does not make intelligible the world, as we find it. Personality alone is capable of intelligent purpose, deliberate aim; — and this is what we see in the adaptations of all organic forms.

What has materialism to oppose to the foregoing conclusion? Perhaps we may be told, that science, by the discovery of the laws of nature, has sufficiently accounted for all existence, without the agency of a Creator. It is sufficient to reply, that the laws of phenomena simply represent the mode of their occurrence, but not the *reason* or the *cause* of that occurrence. As regards the phenomena of adaptation and co-operation for a future result, the most that materialism can do is to set forth the facts of the case, — leaving those facts unexplained, and unexplainable by any theory which accepts atheism. Perhaps the materialist will call our attention to certain seemingly useless parts of organic forms, — parts which are said to be inexplicable on any intelligible plan of adaptation, but perfectly explainable as transition forms in successive stages of development. It may be answered, that our ignorance of the office of certain parts can not invalidate our knowledge of the

office of other parts. If we can not see how the spleen works in a system of organic adjustment, we can see how the stomach, heart, and lungs thus work. If a few small bones in the animal frame are unintelligible on any supposable plan of intelligent adaptation, this does not dim in the least the light of that divine intelligence which gleams forth from every other part of the structure. If we concede to the objection the full weight claimed for it in favor of the theory of development, it only modifies somewhat our ideas of the mode of action of the intelligent personal Cause, without having the least legitimate force to shake our belief in that Cause. It may be that the objector will deny the applicability of the analogical argument to the question of a personal Creator. But he does not hesitate to apply the same argument to all other scientific questions, and scruples not to accept its deductions as undoubted facts of science or laws of nature. Yet the analogy which is applied to the question of creative intelligence is of higher authority than any other; as its recognition comes through personal experience, and rests on consciousness and intuition, while the recognition of all other analogies rests primarily on outward observation. Thus we know, by a more intimate and reliable conviction, that only an intelligent, personal cause can account for the adaptations which we observe in the organic world, than that by which we assume that nothing but iron in the photosphere of the sun can account for certain spectral phenomena exhibited by that luminary. If the logic of science rules our conviction in the latter case, for a stronger reason it binds our belief to the recognition of a personal Creator.

We may therefore fairly claim, that our belief in the existence of a personal Creator rests on a scientific basis of fact, which will remain unshaken, whatever may or may not prove true, as regards the origin of living forms and the transitions through which they have passed and are passing. Suppose the dream of Huxley should be realized as regards the origin of life from inorganic matter, and suppose that the progress of knowledge should more and more confirm the theory of

Darwin, there will still remain those wonderful adaptations, which are characteristic of organization; and these are only intelligible, as the products of creative design. If under the hands of a skillful manipulator, inorganic matter should take on the forms of life,—should shape, adapt, and bind together in harmonious union a system of organs, and these organs should co-operate in working out a plan, such as is implied in the very fact of living,—the *adaptations* and the *plan* would have originated with an intelligent Creator, and not through the blind action of molecular forces. If we adopt the improbable supposition, that the bat has acquired wings by development from the insignificant paws of the shrew, and has learned to use its new organs in flight,—an intelligent Creator has guided the process and implanted the new instinct to correspond. I am the farthest possible from believing that such phenomena have ever occurred, or ever will occur, as the simple results of molecular action, or of natural selection. But I wish strongly to express a firm belief that, whatever may possibly or conceivably occur in that direction, it can not possibly or conceivably shake the firm foundation on which rests the belief in the existence of a personal God.

The power and plan of a Creator, being made conspicuously manifest through the phenomena of organization, must of necessity be present, pervading and controlling in the lower sphere of inorganic forces and laws, for here also we meet with adaptation and orderly adjustment. Indeed, material forces and laws can be naught else than the Creator's voluntary efficiency in, and deliberate guidance of, the material universe; whether we consider the astronomic order that reigns in the planetary spaces, or the equilibrium and motions of molecules and atoms.

With this view of the order of the universe, we need not be much troubled with the special difficulties which scientists have raised, touching the origin and history of life on our globe. The wisdom and power which could plan and execute such works as meet us at every turn, could easily make the transition from the inorganic to the organic. The author of

the plan may be supposed to be master of its details. The builder of a structure may be trusted to compound and shape the materials to be used in construction. If protein is essential to life, the author of life is not dependent for its production on molecular forces, which act independently of his control. If protoplasm has a life of its own, which is the basis of all other forms of life, its mysterious endowment and destiny have originated in creative power and plan.

In attempting to set forth the scientific basis of our belief in a Creator, I do not assume to trace the history of the origin of this belief. Its origin in the history of the race and in the life of the individual, is long anterior to the rise of scientific knowledge. It springs up spontaneously in the presence of the great spectacle of the universe. From the earliest dawn of mental activity, the child recognizes in the forms, adaptations and orderly movements around him, something kindred to the constructive intelligence of which he is conscious in himself. The child's oft-repeated question — Who made this? Who made that? — shows that his faith has already recognized a maker of the things that are. And when you answer his question, by telling him that God has made them all, you have communicated to him no new revelation; you have only given him a personal name for the wisdom and power which already fill his little soul with wonder and reverence. It is not till skepticism calls in question this natural, spontaneous belief, that we ever think of sustaining it by proofs. And when we are called upon to give a reason for the faith that is in us, we have only to reduce to words and to express in logical forms the inarticulate consciousness in which the belief took root, far back in the days of childhood.