

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