ON THE HYPOTHESIS OF EVOLUTION, PHYSICAL AND METAPHYSICAL.

"Man shall not live by bread alone, but by every word that proceedeth out of the mouth of God shall man live."

I.

THERE is apparently considerable repugnance in the minds of many excellent people to the acceptance, or even consideration, of the hypothesis of development, or that of the gradual creation by descent, with modification from the simplest beginnings, of the different forms of the organic world. This objection probably results from two considerations: first, that the human species is certainly involved, and man's descent from an ape asserted; and, secondly, that the scheme in general seems to conflict with that presented by the Mosaic account of the Creation, which is regarded as communicated to its author by an infallible inspiration.

As the truth of the hypothesis is held to be infinitely probable by a majority of the exponents of the natural sciences at the present day, and is held as absolutely demonstrated by another portion, it behooves those interested to restrain their condemnation, and on the other hand to examine its evidences, and look any consequent necessary modification of our metaphysical or theological views squarely in the face.

The following pages state a few of the former: if they suggest some of the latter, it is hoped that they may be such as any logical mind would deduce from the premises. That they will coincide with the spirit of the most advanced Christianity, I have no doubt; and that they will add an appeal through the reason to that direct influence of the Divine Spirit which should control the motives of human action, seems an unavoidable conclusion.

I. PHYSICAL EVOLUTION.

IT is well known that a species is usually represented by a great number of individuals, distinguished from all other similar associations by more or less numerous points of structure, color, size, etc., and by habits and instincts also, to a certain extent; that the individuals of such associations reproduce their like, and cannot be produced by individuals of associations or species which present differences of structure, color, etc., as defined by naturalists; that the individuals of any such series or species are incapable of reproducing with those of any other species, with some exceptions; and that in the latter cases the offspring are usually entirely infertile.

The hypothesis of Cuvier assumes that each species was created by Divine power as we now find it at some definite point of geologic time. The paleontologist holding this view sees, in accordance therewith, a succession of creations and destructions marking the history of life on our planet from its commencement.

The development hypothesis states that all existing species have been derived from species of pre-existent geological periods, as offspring or by direct descent; that there have been no total destructions of life in past time, but only a transfer of it from place to place, owing to changes of circumstance; that the types of structure become simpler and more similar to each other as we trace them from later to earlier periods; and that finally we reach the simplest forms consistent with one or several original parent types of the great divisions into which living beings naturally fall.

It is evident, therefore, that the hypothesis does not include change of

species by hybridization, nor allow the descent of living species from any other *living* species: both these propositions are errors of misapprehension or misrepresentation.

In order to understand the history of creation of a complex being, it is necessary to analyze it and ascertain of what it consists. In analyzing the construction of an animal or plant we readily arrange its characters into those which it possesses in common with other animals or plants, and those in which it resembles none other: the latter are its *individual* characters, constituting its individuality. Next we find a large body of characters, generally of a very obvious kind, which it possesses in common with a generally large number of individuals, which, taken collectively, all men are accustomed to call a species: these characters we consequently name *specific*. Thirdly, we find characters, generally in parts of the body which are of importance in the activities of the animal, or which lie in near relation to its mechanical construction in details, which are shared by a still larger number of individuals than those which were similar in specific characters. In other words, it is common to a large number of species. This kind of character we call *generic*, and the grouping it indicates is a genus.

Farther analysis brings to light characters of organism which are common to a still greater number of individuals: this we call a *family* character. Those which are common to still more numerous individuals are the *ordinal:* they are usually found in parts of the structure which have the closest connection with the whole life-history of the being. Finally, the individuals composing many orders will be found identical in some important character of the systems by which ordinary life is maintained, as in the nervous and circulatory: the divisions thus outlined are called *classes*.

By this process of analysis we reach in our animal or plant those peculiarities which are common to the whole animal or vegetable kingdom, and then we have exhausted the structure so completely that we have nothing remaining to take into account beyond the cell-structure or homogeneous protoplasm by which we know that it is organic, and not a mineral.

The history of the origin of a type, as species, genus, order, etc., is simply the history of the origin of the structure or structures which define those groups respectively. It is nothing more nor less than this, whether a man or an insect be the object of investigation.

EVIDENCES OF DERIVATION.

a. Of Specific Characters.

THE evidences of derivation of species from species, within the limits of the genus, are abundant and conclusive. In the first place, the rule which naturalists observe in defining species is a clear consequence of such a state of things. It is not amount and degree of difference that determine the definition of species from species, but it is the *permanency* of the characters in all cases and under all circumstances. Many species of the systems include varieties and extremes of form, etc., which, were they at all times distinct, and not connected by intermediate forms, would be estimated as species by the same and other writers, as can be easily seen by reference to their works.

Thus, species are either "restricted" or "protean," the latter embracing many, the former few variations; and the varieties included by the protean species are often as different from each other in their typical forms as are the "restricted" species. As an example, the species *Homo sapiens* (man) will suffice. His primary varieties are as distinct as the species of many well-known genera, but cannot be defined, owing to the existence of innumerable intermediate forms between them.

As to the common origin of such "varieties" of the protean species, naturalists never had any doubt, yet when it comes to the restricted "species," the anti-developmentalist denies

it *in toto*. Thus the varieties of most of the domesticated animals are some of them known—others held with great probability to have had a common origin. Varieties of plumage in fowls and canaries are of every-day occurrence, and are produced under our eyes. The cart-horse and racer, the Shetland pony and the Norman, are without doubt derived from the same parentage. The varieties of pigeons and ducks are of the same kind, but not every one is aware of the extent and amount of such variations. The varieties in many characters seen in hogs and cattle, especially when examples from distant countries are compared, are very striking, and are confessedly equal in degree to those found to *define* species in a state of nature: here, however, they are not *definitive*.

It is easy to see that all that is necessary to produce in the mind of the anti-developmentalist the illusion of distinct origin by creation of many of these forms, would be to destroy a number of the intermediate conditions of specific form and structure, and thus to leave remaining definable groups of individuals, and therefore "species."

That such destructions and extinctions have been going on ever since the existence of life on the globe is well known. That it should affect intermediate forms, such as bind together the types of a protean species as well as restricted species, is equally certain. That its result has been to produce *definable* species cannot be denied, especially in consideration of the following facts: Protean species nearly always have a wide geographical distribution. They exist under more varied circumstances than do individuals of a more restricted species. The subordinate variations of the protean species are generally, like the restricted species, confined to distinct subdivisions of the geographical area which the whole occupies. As in geological time changes of level have separated areas once continuous by bodies of water or high mountain ranges, so have vast numbers of individuals occupying such areas been destroyed. Important alterations of temperature, or great changes in abundance or character of vegetable life over given areas, would produce the same result.

This part of the subject might be prolonged, were it necessary, but it has been ably discussed by Darwin. The *rationale* of the "origin of species" as stated by him may be examined a few pages farther on.

β. Of the Characters of Higher Groups.

a. Relations of Structures. The evidences of derivative origin of the structures defining the groups called genera, and all those of higher grade, are of a very different character from those discussed in relation to specific characters: they are more difficult of observation and explanation.

Firstly: It would appear to be supposed by many that the creation of organic types was an irregular and capricious process, variously pursued by its Author as regards time and place, and without definite final aim; and this notwithstanding the wonderful evidences we possess, in the facts of astronomy, chemistry, sound, etc., of His adhesion to harmonious and symmetrical sequences in His modes and plans.

Such regularity of plan is found to exist in the relations of the great divisions of the animal and vegetable kingdoms as at present existing on the earth. Thus, with animals we have a great class of species which consists of nothing more than masses or cells of protoplasmic matter, without distinct organs; or the Protozoa. We have then the Cœlenterata (example, corals), where the organism is composed of many cells arranged in distinct parts, but where a single very simple system of organs, forming the only internal cavity of the body, does the work of the many systems of the more complex animals. Next, the Echinodermata (such as starfish) present us with a body containing distinct systems of organs enclosed in a visceral cavity, including a rudimental nervous system in the form of a ring. In the Molluscs to this condi-

tion is added additional complication, including extensions of the nervous system from the ring as a starting-point, and a special organ for a heart. In the Articulates (crabs, insects) we have like complications, and a long distinct nervous axis on the lower surface of the body. The last branch or division of animals is considered to be higher, because all the systems of life-organs are most complex or specialized. The nervous ring is almost obliterated by a great enlargement of its usual ganglia, thus become a brain, which is succeeded by a long axis on the upper side of the body. This and other points define the Vertebrata.

Plans of structure, independent of the simplicity or perfection of the special arrangement or structure of organs, also define these great groups. Thus the Protozoa present a spiral, the Cœlenterata a radiate, the Echinodermata a bilateral radiate plan. The Articulates are a series of external rings, each in one or more respects repeating the others. The Molluscs are a sac, while a ring above a ring, joined together by a solid centre-piece, represents the plan of each of the many segments of the Vertebrates which give the members of that branch their form.

These bulwarks of distinction of animal types are entered into here simply because they are the most inviolable and radical of those with which we have to deal, and to give the anti-developmentalist the best foothold for his position. I will only allude to the relations of their points of approach as these are affected by considerations afterward introduced.

The Vertebrates approach the Molluscs closely at the lowest extreme of the former and higher of the latter. The lamprey eels of the one possess several characters in common with the cuttle-fish or squids of the latter. The amphioxus is called the lowest Vertebrate, and though it is nothing else, the definition of the division must be altered to receive it: it has no brain!

The lowest forms of the Molluscs and Articulates are scarcely distinguishable from each other, so far as adhesion to the "plan" is concerned, and some of the latter division are very near certain Echinodermata. As we approach the boundary-lines of the two lowest divisions, the approaches become equally close.

More instructive is the evidence of the relation of the subordinate classes of any one of these divisions. The conditions of those organs or parts which define classes exhibit a regular relation, commencing with simplicity and ending with complication; first associated with weak exhibitions of the highest functions of the nervous system—at the last displaying the most exalted traits found in the series.

For example: in the classes of Vertebrates we find the lowest nervous system presents great simplicity—the brain cannot be recognized; next (in lampreys), the end of the nervous axis is subdivided, but scarcely according to the complex type that follows. In fishes the cerebellum and cerebral hemispheres are minute, and the intermediate or optic lobes very large: in the reptiles the cerebral hemispheres exceed the optic lobes, while the cerebellum is smaller. In birds the cerebellum becomes complex and the cerebrum greatly increases. In mammals the cerebellum increases in complexity or number of parts, the optic lobes diminish, while the cerebral hemispheres become wonderfully complex and enlarged, bringing us to the highest development, in man.

The history of the circulatory system in the Vertebrates is the same. First, a heart with one chamber, then one with two divisions: three divisions belong to a large series, and the highest possess four. The origins of the great artery of the body, the aorta, are first five on each side: they lose one in the succeeding class in the ascending scale, and one in each succeeding class or order, till the Mammalia, including man, present us with but one on one side.

From an infinitude of such considerations as the above, we derive the certainty that the general arrangement of

the various groups of the organic world is in scales, the subordinate within the more comprehensive divisions. The identification of all the parts in such a complexity of organism as the highest animals present, is a matter requiring much care and attention, and constitutes the study of homologies. Its pursuit has resulted in the demonstration that every individual of every species of a given branch of the animal kingdom is composed of elements common to all, and that the differences which are so radical in the higher groups are but the modifications of the same elemental parts, representing completeness or incompleteness, obliteration or subdivision. Of the former character are rudimental organs, of which almost every species possesses an example in some part of its structure.

But we have other and still more satisfactory evidence of the meaning of these relations. By the study of embryology we can prove most indubitably that the simple and less complex are inferior to the more complex. Selecting the Vertebrates again as an example, the highest form of mammal—*e. g.*, man—presents in his earliest stages of embryonic growth a skeleton of cartilage, like that of the lamprey: he also possesses five origins of the aorta and five slits on the neck, both which characters belong to the lamprey and the shark. If the whole number of these parts does not coexist in the embryonic man, we find in embryos of lower forms more nearly related to the lamprey that they do. Later in the life of the mammal but four aortic origins are found, which arrangement, with the heart now divided into two chambers, from a beginning as a simple tube, is characteristic of the class of Vertebrates next in order—the bony fishes. The optic lobes of the human brain have also at this time a great predominance in size—a character above stated to be that of the same class. With advancing development the infant mammal follows the scale already pointed out. Three chambers of the heart and three aortic origins follow, presenting the condition permanent in the batrachia; and two origins, with enlarged cerebral hemispheres of the brain, resemble the reptilian condition. Four heart-chambers, and one aortic root on each side, with slight development of the cerebellum, follow all characters defining the crocodiles, and immediately precede the special conditions defining the mammals. These are, the single aorta root from one side, and the full development of the cerebellum: later comes that of the cerebrum also in its higher mammalian and human traits.

Thus we see the order already pointed out to be true, and to be an ascending one. This is the more evident as each type or class passes through the conditions of those below it, as did the mammal; each scale being shorter as its highest terminus is lower. Thus the crocodile passes through the stage of the lamprey, the fish, the batrachian and the reptile proper.

b. In Time. We have thus a scale of relations of existing forms of animals and plants of a remarkable kind, and such as to stimulate greatly our inquiries as to its significance. When we turn to the remains of the past creation preserved to us in the deposits continued throughout geologic time, we are not disappointed, for great light is at once thrown upon the subject.

We find, in brief, that the lowest division of the animal kingdom appeared first, and long before any type of a higher character was created. The Protozoön, Eozoön, is the earliest of animals in geologic time, and represents the lowest type of animal life now existing. We learn also that the highest branch appeared last. No remains of Vertebrates have been found below the lower Devonian period, or not until the Echinoderms and Molluscs had reached a great pre-eminence. It is difficult to be sure whether the Protozoa had a greater numerical extent in the earliest periods than now, but there can be no doubt that the Cœlenterata (corals) and Echinoderms (crinoids) greatly exceeded their present bounds, in Paleozoic time, so that those at present existing are but a feeble remnant. If we exam-

ine the subdivisions known as classes, evidence of the nature of the succession of creation is still more conclusive. The most polyp-like of the Molluscs (brachiopoda) constituted the great mass of its representatives during Paleozoic time. Among Vertebrates the fishes appear first, and had their greatest development in size and numbers during the earliest periods of the existence of the division. Batrachia were much the largest and most important of land animals during the Carboniferous period, while the higher Vertebrates were unknown. The later Mesozoic periods saw the reign of reptiles, whose position in structural development has been already stated. Finally, the most perfect, the mammal, came upon the scene, and in his humblest representatives. In Tertiary times mammalia supplanted the reptiles entirely, and the unspiritual mammals now yield to man, the only one of his class in whom the Divine image appears.

Thus the structural relations, the embryonic characters, and the successive appearance in time of animals coincide. The same is very probably true of plants.

That the existing state of the geological record of organic types should be regarded as anything but a fragment is, from our stand-point, quite preposterous. And more, it may be assumed with safety that when completed it will furnish us with a series of regular successions, with but slight and regular interruptions, if any, from the species which represented the simplest beginnings of life at the dawn of creation, to those which have displayed complication and power in later or in the present period.

For the labors of the paleontologist are daily bringing to light structures intermediate between those never before so connected, and thus creating lines of succession where before were only interruptions. Many such instances might be adduced: two might be selected as examples from American paleontology; *i. e.*, the near approach to birds made by the reptiles Lælaps and Megadactylus, and the combination of characters of the old genera Ichthyosaurus and Plesiosaurus in the Polycotylus of Kansas.*

* Professor Huxley, in the last anniversary lecture before the Geological Society of London, recalls his opinion, enunciated in 1862, that "the positively-ascertained truths of Paleontology" negative "the doctrines of progressive modification, which suppose that modification to have taken place by a necessary progress from more to less embryonic forms, from more to less generalized types, within the limits of the period represented by the fossiliferous rocks; that it shows no evidence of such modification; and as to the nature of that modification, it yields no evidence whatsoever that the earlier members of any long-continued group were more generalized in structure than the later ones."

Respecting this position, he says: "Thus far I have endeavored to expand and enforce by fresh arguments, but not to modify in any important respect, the ideas submitted to you on a former occasion. But when I come to the propositions respecting progressive modification, it appears to me, with the help of the new light which has broken from various quarters, that there is much ground for softening the somewhat Brutus-like severity with which I have dealt with a doctrine for the truth of which I should have been glad enough to be able to find a good foundation in 1862. So far indeed as the Invertebrata and the lower Vertebrata are concerned, the facts, and the conclusions which are to be drawn from them, appear to me to remain what they were. For anything that as yet appears to the contrary, the earliest known marsupials may have been as highly organized as their living congeners; the Permian lizards show no signs of inferiority to those of the present day; the labyrinthodonts cannot be placed below the living salamander and triton; the Devonian ganoids are closely related to polypterus and lepidosiren."

To this it may be replied: 1. The scale of progression of the Vertebrata is measured by the conditions of the circulatory system, and in some measure by the nervous, and not by the osseous: tested by this scale, there has been successional complication of structure among Vertebrata in time. 2. The question with the evolutionist is, not what types have persisted to the present day, but the order in which types appeared in time. 3. The marsupials, Permian saurians, labyrinthodonts and Devonian ganoids are remarkably generalized groups, and predecessors of types widely separated in the present period. 4. Professor Huxley adduces many such examples among the mammalian subdivisions in the remaining portion of his lecture. 5. Two alternatives are yet open in the explanation of the process of evolution: since generalized types, which combine the characters of higher and lower groups of later periods, must thus be superior to the lower, the lower must (first) be descended from such a generalized form by degradation; or (second) not descended from it at all, but from some lower contemporaneous type by advance; the higher only of the two being derived from the first-mentioned. The last I suspect to be a true explanation, as it is in accordance with the law of homologous groups. This law will shorten the demands of paleontologists for time, since, instead of deriving all reptilia, batrachia, etc., from common origins, it points to the derivation of higher reptilia of a higher order from higher reptilia of a lower order, lower reptilia of the first from lower reptilia of the second; finally, the several groups of the lowest or most generalized order of reptilia from a parallel series of the class below, or batrachia.

We had no more reason to look for intermediate or connecting forms between such types as these, than between any others of similar degree of remove from each other with which we are acquainted. And inasmuch as almost all groups, as genera, orders, etc., which are held to be distinct, but adjacent, present certain points of approximation to each other, the almost daily discovery of intermediate forms gives us confidence to believe that the pointings in other cases will also be realized.

γ. *Of Transitions.*

THE preceding statements were necessary to the comprehension of the supposed mode of metamorphosis or development of the various types of living beings, or, in other words, of the single structural features which define them.

As it is evident that the groups of highest rank have had their origin in remote ages, cases of transition from one to the other by change of character cannot be witnessed at the present day. We therefore look to the most nearly related divisions, or those of the lowest rank, for evidence of such change.

It is necessary to premise that embryology teaches that all the species of a given branch of the animal kingdom (*e. g.*, Vertebrate, Mollusc, etc.) are quite identical in structural character at their first appearance on the germinal layer of the yolk of the parent egg. It shows that the characters of the respective groups of high rank appear first, then those of less grade, and last of all those structures which distinguish them as genera. But among the earliest characters which appear are those of the species, and some of those of the individual.

We find the characters of different *genera* to bear the same relation to each other that we have already seen in the case of those definitive of orders, etc. In a natural assemblage of related genera we discover that some are defined by characters found only in the embryonic stages of others; while a second will present a permanent condition of its definitive part, which marks a more advanced stage of that highest. In this manner many stages of the highest genus appear to be represented by permanent genera in all natural groups. Generally, however, this resemblance does not involve an entire identity, there being some other immaturities found in the highest genus at the time it presents the character preserved in permanency by the lower, which the lower loses. Thus (to use a very coarse example) a frog at one stage of growth has four legs and a tail: the salamander always preserves four legs and a tail, thus resembling the young frog. The latter is, however, not a salamander at that time, because, among other things, the skeleton is represented by cartilage only, and the salamander's is ossified. This relation is therefore an imitation only, and is called *inexact parallelism*.

As we compare nearer and nearer relations—*i. e.*, the genera which present fewest points of difference — we find the differences between undeveloped stages of the higher and permanent conditions of the lower to grow fewer and fewer, until we find numerous instances where the lower genus is exactly the same as the undeveloped stage of the higher. This relation is called that of *exact parallelism*.

It must now be remembered that the permanence of a character is what gives it its value in defining genus, order, etc., in the eyes of the systematist. So long as the condition is permanent no transition can be seen: there is therefore no development. If the condition is transitional, it defines nothing, and nothing is developed; at least, so says the anti-developmentalist. It is the old story of the settler and the Indian: "Will you take owl and I take turkey, or I take turkey and you owl?"

If we find a relation of *exact parallelism* to exist between two sets of species in the condition of a certain organ, and the difference so expressed the only one which distinguishes them as sets from each other—if that condition is always the same in each set—we call them two genera: if in any species the condition

is variable at maturity, or sometimes the undeveloped condition of the part is persistent and sometimes transitory, the sets characterized by this difference must be united by the systematist, and the whole is called a single genus.

We know numerous cases where different individuals of the same species present this relation of *exact parallelism* to each other; and as we ascribe common origin to the individuals of a species, we are assured that the condition of the inferior individual is, in this case, simply one of repressed growth, or a failure to fulfill the course accomplished by the highest. Thus, certain species of the salamandrine genus amblystoma undergo a metamorphosis involving several parts of the osseous and circulatory systems, etc., while half grown; others delay it till fully grown; one or two species remain indifferently unchanged or changed, and breed in either condition, while another species breeds unchanged, and has never been known to complete a metamorphosis.

The nature of the relation of *exact parallelism* is thus explained to be that of checked or advanced growth of individuals having a common origin. The relation of *inexact parallelism* is readily explained as follows: With a case of *exact parallelism* in the mind, let the repression producing the character of the lower, parallelize the latter with a stage of the former in which a second part is not quite mature: we will have a slight want of correspondence between the two. The lower will be immature in but one point, the incompleteness of the higher being seen in two points. If we suppose the immaturity to consist in a repression at a still earlier point in the history of the higher, the latter will be undeveloped in other points also: thus, the spike-horned deer of South America have the horn of the second year of the North American genus. They would be generically identical with that stage of the latter, were it not that these still possess their milk dentition at two years of age. In the same way the nature of the parallelisms seen in higher groups, as orders, etc., may be accounted for.

The theory of homologous groups furnishes important evidence in favor of derivation. Many orders of animals (probably all, when we come to know them) are divisible into two or more sections, which I have called *homologous*. These are series of genera or families, which differ from each other by some marked character, but whose contained genera or families differ from each other in the same points of detail, and in fact correspond exactly. So striking is this correspondence that were it not for the general and common character separating the homologous series, they would be regarded as the same, each to each. Now it is remarkable that where studied the difference common to all the terms of two homologous groups is found to be one of *inexact parallelism*, which has been shown above to be evidence of descent. Homologous groups always occupy different geographical areas on the earth's surface, and their relation is precisely that which holds between successive groups of life in the periods of geologic time.

In a word, we learn from this source that distinct geologic epochs coexist at the same time on the earth. I have been forced to this conclusion* by a study of the structure of terrestrial life, and it has been remarkably confirmed by the results of recent deep-sea dredgings made by the United States Coast Survey in the Gulf Stream, and by the British naturalists in the North Atlantic. These have brought to light types of Tertiary life, and of even the still more ancient Cretaceous periods, living at the present day. That this discovery invalidates in any wise the conclusions of geology respecting lapse of time is an unwarranted assumption that some are forward to make. If it changes the views of some respecting the parallelism or coexistence of faunæ in different regions of the earth, it is only the anti-developmentalists whose position must be changed.

For, if we find distinct geologic faunæ, or epochs defined by faunæ, coexisting during the present period, and

* *Origin of Genera*, pages 70, 77, 79.

fading or emerging into one another as they do at their geographical boundaries, it is proof positive that the geologic epochs and periods of past ages had in like manner no trenchant boundaries, but also passed the one into the other. The assumption that the apparent interruptions are the result of transfer of life rather than destruction, or of want of opportunities of preservation, is no doubt the true one.

δ. Rationale of Development.

a. In Characters of Higher Groups. It is evident in the case of the species in which there is an irregularity in the time of completion of metamorphosis that some individuals traverse a longer developmental line than those who remain more or less incomplete. As both accomplish growth in the same length of time, it is obvious that it proceeds with greater rapidity in one sense in that which accomplishes most: its growth is said to be accelerated. This phenomenon is especially common among insects, where the females of perfect males are sometimes larvæ or nearly so, or pupæ, or lack wings or some character of final development. Quite as frequently, some males assume characters in advance of others, sometimes in connection with a peculiar geographical range.

In cases of *exact parallelism* we reasonably suppose the cause to be the same, since the conditions are identical, as has been shown; that is, the higher conditions have been produced by a crowding back of the earlier characters and an acceleration of growth, so that a given succession in order of advance has extended over a longer range of growth than its predecessor in the same allotted time. That allotted time is the period before maturity and reproduction, and it is evident that as fast as modifications or characters should be assumed sufficiently in advance of that period, so certainly would they be conferred upon the offspring by reproduction. The *acceleration* in the assumption of a character, progressing more rapidly than the same in another character, must soon produce, in a type whose stages were once the exact parallel of a permanent lower form, the condition of *inexact parallelism*. As all the more comprehensive groups present this relation to each other, we are compelled to believe that *acceleration* has been the principle of their successive evolution during the long ages of geologic time.

Each type has, however, its day of supremacy and perfection of organism, and a retrogression in these respects has succeeded. This has no doubt followed a law the reverse of acceleration, which has been called *retardation*. By the increasing slowness of the growth of the individuals of a genus, and later and later assumption of the characters of the latter, they would be successively lost.

To what power shall we ascribe this acceleration, by which the first beginnings of structure have accumulated to themselves through the long geologic ages complication and power, till from the germ that was scarcely born into a sand-lance, a human being climbed the complete scale, and stood easily the chief of the whole?

In the cases of species, where some individuals develop farther than others, we say that the former possess more growth-force, or "vigor," than the latter. We may therefore say that higher types of structure possess more "vigor" than the lower. This, however, we do not know to be true, nor can we readily find means to demonstrate it.

The food which is taken by an adult animal is either assimilated, to be consumed in immediate activity of some kind, or stored for future use, and the excess is rejected from the body. We have no reason to suppose that the same kind of material could be made to subserve the production of force by any other means than that furnished by a living animal organism. The material from which this organism is constructed is derived first from the parent, and afterward from the food, etc., assimilated by the individual itself so long as growth continues. As it is the activity of assimilation directed to a special end during this latter period which we suppose

to be increased in accelerated development, the acceleration is evidently not brought about by increased facilities for obtaining the means of life which the same individual possesses as an adult. That it is not in consequence of such increased facilities possessed by its parents over those of the type preceding it, seems equally improbable when we consider that the characters in which the parent's advance has appeared are rarely of a nature to increase those facilities.

The nearest approach to an explanation that can be offered appears to be somewhat in the following direction:

There is every reason to believe that the character of the atmosphere has gradually changed during geologic time, and that various constituents of the mixture have been successively removed from it, and been stored in the solid material of the earth's crust in a state of combination. Geological chemistry has shown that the cooling of the earth has been accompanied by the precipitation of many substances only gaseous at high temperatures. Hydrochloric and sulphuric acids have been transferred to mineral deposits or aqueous solutions. The removal of carbonic acid gas and the vapor of water has been a process of much slower progress, and after the expiration of all the ages a proportion of both yet remains. Evidence of the abundance of the former in the earliest periods is seen in the vast deposits of limestone rock; later, in the prodigious quantities of shells which have been elaborated from the same in solution. Proof of its abundance in the atmosphere in later periods is seen in the extensive deposits of coal of the Carboniferous, Triassic and Jurassic periods. If the most luxuriant vegetation of the present day takes but fifty tons of carbon from the atmosphere in a century, per acre, thus producing a layer over that extent of less than a third of an inch in thickness, what amount of carbon must be abstracted in order to produce strata of thirty-five feet in depth? No doubt it occupied a long period, but the atmosphere, thus deprived of a large proportion of carbonic acid, would in subsequent periods undoubtedly possess an improved capacity for the support of animal life.

The successively higher degree of oxidization of the blood in the organs designed for that function, whether performing it in water or air, would certainly accelerate the performances of all the vital functions, and among others that of growth. Thus it may be that *acceleration* can be accounted for, and the process of the development of the orders and sundry lesser groups of the Vertebrate kingdom indicated; for, as already pointed out, the definitions of such are radically placed in the different structures of the organs which aerate the blood and distribute it to its various destinations.

But the great question, What determined the direction of this acceleration? remains unanswered. One cannot understand why more highly-oxidized blood should hasten the growth of partition of the ventricle of the heart in the serpent, the more perfectly to separate the aerated from the impure fluid; nor can we see why a more perfectly-constructed circulatory system, sending purer blood to the brain, should direct accelerated growth to the cerebellum or cerebral hemispheres in the crocodile.

b. In Characters of the Specific Kind. Some of the characters usually placed in the specific category have been shown to be the same in kind as those of higher categories. The majority are, however, of a different kind, and have been discussed several pages back.

The cause of the origin of these characters is shrouded in as much mystery as that of those which have occupied the pages immediately preceding. As in that case, we have to assume, as Darwin has done, a tendency in Nature to their production. This is what he terms "the principle of variation." Against an unlimited variation the great law of heredity or atavism has ever been opposed, as a conservator and multiplier of type. This principle is exemplified in the fact that like produces like—that children are like their

parents, frequently even in minutiæ. It may be compared to habit in metaphysical matters, or to that singular love of time or rhythm seen in man and lower animals, in both of which the tendency is to repeat in continual cycles a motion or state of the mind or sense.

Further, but a proportion of the lines of variation is supposed to have been perpetuated, and the extinction of intermediate forms, as already stated, has left isolated groups or species.

The effective cause of these extinctions is stated by Darwin to have been a "natural selection"—a proposition which distinguishes his theory from other development hypotheses, and which is stated in brief by the expression, "the preservation of the fittest." Its meaning is this: that those characters appearing as results of this spontaneous variation which are little adapted to the conflict for subsistence, with the nature of the supply, or with rivals in its pursuit, dwindle and are sooner or later extirpated; while those which are adapted to their surroundings, and favored in the struggle for means of life and increase, predominate, and ultimately become the centres of new variation. "I am convinced," says Darwin, "that natural selection has been the main, but not exclusive, means of modification."

That it has been to a large extent the means of preservation of those structures known as specific, must, I think, be admitted. They are related to their peculiar surroundings very closely, and are therefore more likely to exist under their influence. Thus, if a given genus extends its range over a continent, it is usually found to be represented by peculiar species—one in a maritime division, another in the desert, others in the forest, in the swamp or the elevated areas of the region. The wonderful interdependence shown by Darwin to exist between insects and plants in the fertilization of the latter, or between animals and their food-plants, would almost induce one to believe that it were the true expression of the whole law of development.

But the following are serious objections to its universal application:

First: The characters of the higher groups, from genera up, are rarely of a character to fit their possessors especially for surrounding circumstances; that is, the differences which separate genus from genus, order from order, etc., in the ascending scale of each, do not seem to present a superior adaptation to surrounding circumstances in the higher genus to that seen in the lower genus, etc. Hence, superior adaptation could scarcely have caused their selection above other forms not existing. Or, in other words, the very differences in structure which indicate successional relation, or which measure the steps of progress, seem to be equally well fitted for their surroundings.

Second: The higher groups, as orders, classes, etc., have been in each geologic period alike distributed over the whole earth, under all the varied circumstances offered by climate and food. Their characters do not seem to have been modified in reference to these. Species, and often genera, are, on the other hand, eminently restricted according to climate, and consequently vegetable and animal food.

The law of development which we seek is indeed not that which preserves the higher forms and rejects the lower after their creation, but that which explains why higher forms were created at all. Why in the results of a creation we see any relation of higher and lower, and not rather a world of distinct types, each perfectly adapted to its situation, but none properly higher than another in an ascending scale, is the primary question. Given the principle of advance, then natural selection has no doubt modified the details; but in the successive advances we can scarcely believe such a principle to be influential. We look rather upon a progress as the result of the expenditure of some force fore-arranged for that end.

It may become, then, a question whether in characters of high grade the habit or use is not rather the result of the acquisition of the structure than the

structure the result of the encouragement offered to its assumed beginnings by use, or by liberal nutrition derived from the increasingly superior advantages it offers.

e. The Physical Origin of Man.

IF the hypothesis here maintained be true, man is the descendant of some pre-existent generic type, the which, if it were now living, we would probably call an ape.

Man and the chimpanzee were in Linnæus' system only two species of the same genus, but a truer anatomy places them in separate genera and distinct families. There is no doubt, however, that Cuvier went much too far when he proposed to consider Homo as the representative of an order distinct from the quadrumana, under the name of bimana. The structural differences will not bear any such interpretation, and have not the same value as those distinguishing the orders of mammalia; as, for instance, between carnivora and bats, or the cloven-footed animals and the rodents, or rodents and edentates. The differences between man and the chimpanzee are, as Huxley well puts it, much less than those between the chimpanzee and lower quadrumana, as lemurs, etc. In fact, man is the type of a family, Hominidæ, of the order Quadrumana, as indicated by the characters of the dentition, extremities, brain, etc. The reader who may have any doubts on this score may read the dissections of Geoffroy St. Hilaire, made in 1856, before the issue of Darwin's *Origin of Species*. He informs us that the brain of man is nearer in structure to that of the orang than the orang's is to that of the South American howler, and that the orang and howler are more nearly related in this regard than are the howler and the marmoset.

The modifications presented by man have, then, resulted from an acceleration in development in some respects, and retardation perhaps in others. But until the *combination* now characteristic of the genus Homo was attained the being could not properly be called man.

And here it must be observed that as an organic type is characterized by the coexistence of a number of peculiarities which have been developed independently of each other, its distinctive features and striking functions are not exhibited until that coexistence is attained which is necessary for these ends.

Hence, the characters of the human genus were probably developed successively: but few of the indications of human superiority appeared until the combination was accomplished. Let the opposable thumb be first perfected, but of what use would it be in human affairs without a mind to direct? And of what use a mind without speech to unlock it? And speech could not be possible though all the muscles of the larynx but one were developed, or but a slight abnormal convexity in one pair of cartilages remained.

It would be an objection of little weight could it be truly urged that there have as yet no remains of apelike men been discovered, for we have frequently been called upon in the course of paleontological discovery to bridge greater gaps than this, and greater remain, which we expect to fill. But we *have* apelike characters exhibited by more than one race of men yet existing.

But the remains of that being which is supposed to have been the progenitor of man may have been discovered a short time since in the cave of Naulette, Belgium, with the bones of the extinct rhinoceros and elephant.

We all admit the existence of higher and lower races, the latter being those which we now find to present greater or less approximations to the apes. The peculiar structural characters that belong to the negro in his most typical form are of that kind, however great may be the distance of his remove therefrom. The flattening of the nose and prolongation of the jaws constitute such a resemblance; so are the deficiency of the calf of the leg, and the obliquity of the pelvis, which approaches more the horizontal position than it does in the Caucasian. The investigations made at Washington during the war

with reference to the physical characteristics of the soldiers show that the arms of the negro are from one to two inches longer than those of the whites: another approximation to the ape. In fact, this race is a species of the genus Homo as distinct in character from the Caucasian as those we are accustomed to recognize in other departments of the animal kingdom; but he is not distinct by isolation, since intermediate forms between him and the other species can be abundantly found.

And here let it be particularly observed that two of the most prominent characters of the negro are those of immature stages of the Indo-European race in its characteristic types. The deficient calf is the character of infants at a very early stage; but, what is more important, the flattened bridge of the nose and shortened nasal cartilages are universally immature conditions of the same parts in the Indo-European. Any one may convince himself of that by examining the physiognomies of infants. In some races—*e. g.*, the Slavic—this undeveloped character persists later than in some others. The Greek nose, with its elevated bridge, coincides not only with æsthetic beauty, but with developmental perfection.

This is, however, only "*inexact* parallelism," as the characters of the hair, etc., cannot be explained on this principle *among existing races*. The embryonic characters mentioned are probably a remnant of those characteristic of the primordial race or species.

But the man of Naulette, if he be not a monstrosity, is a still more distinct and apelike species. The chin, that marked character of other species of men, is totally wanting, and the dentition is quite approximate to the manlike apes, and different from that of modern men. The form is very massive, as in apes. That he was not abnormal is rendered probable by approximate characters seen in a jaw from the cave of Puy-sur-Aube, and less marked in the lowest races of Australia and New Caledonia.

EDWARD D. COPE.

ON THE HYPOTHESIS OF EVOLUTION, PHYSICAL AND METAPHYSICAL.

II.

AS to the single or multiple origin of man, science as yet furnishes no answer. It is very probable that, in many cases, the species of one genus have descended from corresponding species of another by change of generic characters only. It is a remarkable fact that the orang possesses the peculiarly developed malar bones and the copper color characteristic of the Mongolian inhabitants of the regions in which this animal is found, while the gorilla exhibits the prognathic jaws and black hue of the African races near whom he dwells. This kind of geographical imitation is very common in the animal kingdom.

ζ. *The Mosaic Account.*

As some persons imagine that this hypothesis conflicts with the account of the creation of man given in Genesis, a comparison of some of the points involved is made below.

First: In Genesis i. 26, 27 we read, "And God said, Let us make man in our image, after our likeness," etc. "So God created man in his own image, in the image of God created he him; male and female created he them." Those who believe that this "image" is a physical, material form, are not disposed to admit the entrance of anything ape-like into its constitution, for the ascription of any such appearance to the Creator would be impious and revolting. But we are told that "God is a Spirit," and Christ said to his disciples after his resurrection, "A spirit hath not flesh and bones, as ye see me have." Luke xxiv. 39. It will require little further argument to show that a mental and spiritual image is what is meant, as it is what truly exists. Man's conscience, intelligence and creative ingenuity show that he possesses an "image of God" within him, the possession of which is really necessary to his limited comprehension of God and of God's ways to man.

Second: In Gen. ii. 7 the text reads, "And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul." The fact that man is the result of the modification of an ape-like predecessor nowise conflicts with the above statement as to the materials of which his body is composed. Independently of origin, if the body of man be composed of dust, so must that of the ape be, since the composition of the two is identical. But the statement simply asserts that man was created of the same materials which compose the earth: their condition as "dust" depending merely on temperature and subdivision. The declaration, "Dust thou art, and unto dust thou shalt return," must be taken in a similar sense, for we know that the decaying body is resolved not only into its earthy constituents, but also into carbonic acid gas and water.

When God breathed into man's nostrils the breath of life, we are informed that he became, not a living body, but "a living soul." His descent from a pre-existent being involved the possession of a living body; but when the Creator breathed into him we may suppose that He infused into this body the immortal part, and at that moment man became a conscientious and responsible being.

II. METAPHYSICAL EVOLUTION.

IT is infinitely improbable that a being endowed with such capacities for gradual progress as man has exhibited, should have been full fledged in accom-

plishments at the moment when he could first claim his high title, and abandon that of his simious ancestors. We are therefore required to admit the growth of human intelligence from a primitive state of inactivity and absolute ignorance; including the development of one important mode of its expression — speech; as well as that of the moral qualities, and of man's social system—the form in which his ideas of morality were first displayed.

The expression "evolution of morality" need not offend, for the question in regard to the *laws* of this evolution is the really important part of the discussion, and it is to the opposing views on this point that the most serious interest attaches.

That the theory of physical development is consistent with Genesis will, I think, before long be admitted by most persons; but the correlation of the facts of metaphysical evolution with the theologies of some of the churches will require more care.

The two views of evolution already treated of, held separately, are quite opposed to each other. The first (and generally received) lays stress on the influence of external surroundings, as the stimulus to and guidance of development: it is the counterpart of Darwin's principle called Natural Selection in material progress. This might be called the *Conflict theory*. The second view recognizes the workings of a force whose nature we do not know, whose exhibitions accord perfectly with their external surroundings (or other exhibitions of itself), without being under their influence or more related to them, as effect to cause, than the notes of the musical octave or the colors of the spectrum are to each other. This is the *Harmonic theory*. In other words, the first principle deduces perfection from struggle and discord; the second, from the coincident progress of many parts, forming together a divine harmony comparable to music. That these principles are both true is rendered extremely probable by the actual phenomena of development, material and immaterial. In other words, struggle and discord ever await that which is not in the advance, and which fails to keep pace with the harmonious development of the whole.

All who have studied the phenomena of the creation believe that there exists in it a grand and noble harmony, such as was described to Job when he was told that "the morning stars sang together, and all the sons of God shouted for joy."

a. *Development of Intelligence.*

IF the brain is the organ of mind, we may be surprised to find that the brain of the intelligent man scarcely differs in structure from that of the ape. Whence, then, the difference of power? Though no one will now deny that many of the Mammalia are capable of reasoning upon observed facts, yet how greatly the results of this capacity differ in number and importance from those achieved by human intelligence! Like water at the temperatures of 50° and 53°, where we perceive no difference in essential character, so between the brains of the lower and higher monkeys no difference of function or of intelligence is perceptible. But what a difference do the two degrees of temperature from 33° to 31° produce in water! In like manner the difference between the brain of the higher ape and that of man is accompanied by a difference in function and power, on which man's earthly destiny depends. In development, as with the water so with the higher ape: some Rubicon has been crossed, some floodgate has been opened, which marks one of Nature's great transitions, such as have been called "Expression points" of progress.

What point of progress in such a history would account for this accession of the powers of the human intelligence? It has been answered, with considerable confidence, The power of speech. Let us picture man without speech. Each generation of men would learn nothing from its predecessors. Whatever originality or observation might yield to a man would

die with him. Each intellectual life would begin where every other life began, and would end at a point only differing with its original capacity. Concert of action, by which man's power over the material world is maintained, would not exceed, if it equaled, that which is seen among the bees; and the material results of his labors would not extend beyond securing the means of life and the employment of the simplest modes of defence and attack.

The first men, therefore, are looked upon by the developmentalists as extremely embryonic in all that characterizes humanity, and they appeal to the facts of history in support of this view. If they do not derive much assistance from written history, evidence is found in the more enduring relics of human handiwork.

The opposing view is, that the races which present or have presented this condition of inferiority or savagery have reached it by a process of degradation from a higher state—as some believe, through moral delinquency. This position may be true in certain cases, which represent perhaps a condition of senility, but in general we believe that savagery was the condition of the first man, which has in some races continued to the present day.

β. Evidence from Archæology.

As the object of the present essay is not to examine fully into the evidences for the theories of evolution here stated, but rather to give a sketch of such theories and their connection, a few facts only will be noticed.

Improvement in the Use of Materials. As is well known, the remains of human handiwork of the earliest periods consist of nothing but rude implements of stone and bone, useful only in procuring food and preparing it for use. Even when enterprise extended beyond the ordinary routine, it was restrained by the want of proper instruments. Knives and other cutting implements of flint still attest the skill of the early races of men from Java to the Cape of Good Hope, from Egypt to Ireland, and through North and South America. Hatchets, spear-heads and ornaments of serpentine, granite, silex, clay slates, and all other suitable rock materials, are found to have been used by the first men, to the exclusion of metals, in most of the regions of the earth.

Later, the probably accidental discovery of the superiority of some of the metals resulted in the substitution of them for stone as a material for cutting implements. Copper—the only metal which, while malleable, is hard enough to bear an imperfect edge—was used by succeeding races in the Old World and the New. Implements of this material are found scattered over extensive regions. So desirable, however, did the hardening of the material appear for the improvement of the cutting edge that combinations with other metals were sought for and discovered. The alloy with tin, forming bronze and brass, was discovered and used in Europe, while that with silver appears to have been most readily produced in America, and was consequently used by the Peruvians and other nations.

The discovery of the modes of reducing iron ores placed in the hands of man the best material for bringing to a shape convenient for his needs the raw material of the world. All improvements in this direction made since that time have been in the quality of iron itself, and not through the introduction of any new metal.

The prevalent phenomena of any given period are those which give it its character, and by which we distinguish it. But this fact does not exclude the coexistence of other phenomena belonging to prior or subsequent stages. Thus, during the many stages of human progress there have been men more or less in advance of the general body, and their characteristics have given a peculiar stamp to the later and higher condition of the whole. It furnishes no objection to this view that we find, as might have been anticipated, the stone, bronze and iron periods overlapping one another, or men of an inferior culture supplanting in some cases a

superior people. A case of this kind is seen in North America, where the existing "Indians," stone-men, have succeeded the mound-builders, coppermen. The successional relation of discoveries is all that it is necessary to prove, and this seems to be established.

The period at which the use of metallic implements was introduced is unknown, but Whitney says that the language of the Aryans, the ancestors of all the modern Indo-Europeans, indicates an acquaintance with such implements, though it is not certain whether those of iron are to be included. The dispersion of the daughter races, the Hindoos, the Pelasgi, Teutons, Celts, etc., could not, it is thought, have taken place later than 3000 B. C.—a date seven hundred years prior to that assigned by the old chronology to the Deluge. Those races coexisted with the Egyptian and Chinese nations, already civilized, and as distinct from each other in feature as they are now.

Improvement in Architecture. The earliest periods, then, were characterized by the utmost simplicity of invention and construction. Later, the efforts for defence from enemies and for architectural display, which have always employed so much time and power, began to be made. The megalithic period has left traces over much of the earth. The great masses of stone piled on each other in the simplest form in Southern India, and the circles of stones planted on end in England at Stonehenge and Abury, and in Peru at Sillustani, are relics of that period. More complex are the great Himyaritic walls of Arabia, the works of the ancestors of the Phœnicians in Asia Minor, and the titanic workmanship of the Pelasgi in Greece and Italy. In the iron age we find granitic hills shaped or excavated into temples; as, for example, everywhere in Southern India. Near Madura the circumference of an acropolis-like hill is cut into a series of statues in high relief, of sixty feet in elevation. Easter Island, composed of two volcanic cones, one thousand miles from the west coast of South America, in the bosom of the Pacific, possesses several colossi cut from the intrusive basalt, some in high relief on the face of the rock, others in detached blocks removed by human art from their original positions and brought nearer the sea-shore.

Finally, at a more advanced stage, the more ornate and complex structures of Central America, of Cambodia, Nineveh and Egypt, represent the period of greatest display of architectural expenditure. The same amount of human force has perhaps never been expended in this direction since, though higher conceptions of beauty have been developed in architecture with increasing intellectuality.

Man has passed through the block-and-brick building period of his boyhood, and should rise to higher conceptions of what is the true disposition of power for "him who builds for aye," and learn that "spectacle" is often the unwilling friend of progress.

No traces of metallic implements have ever been found in the salt-mines of Armenia, the turquoise-quarries in Arabia, the cities of Central America or the excavations for mica in North Carolina, while the direct evidence points to the conclusion that in those places flint was exclusively used.

The simplest occupations, as requiring the least exercise of mind, are the pursuit of the chase and the tending of flocks and herds. Accordingly, we find our first parents engaged in these occupations. Cain, we are told, was, in addition, a tiller of the ground. Agriculture in its simplest forms requires but little more intelligence than the pursuits just mentioned, though no employment is capable of higher development. If we look at the savage nations at present occupying nearly half the land surface of the earth, we shall find many examples of the former industrial condition of our race preserved to the present day. Many of them had no knowledge of the use of metals until they obtained it from civilized men who visited them, while their pursuits were and are those of the chase, tending domestic animals, and rudimental agriculture.

γ. The Development of Language.

IN this department the fact of development from the simple to the complex has been so satisfactorily demonstrated by philologists as scarcely to require notice here. The course of that development has been from monosyllabic to polysyllabic forms, and also in a process of differentiation, as derivative races were broken off from the original stock and scattered widely apart. The evidence is clear that simple words for distinct objects formed the bases of the primal languages, just as the ground, tree, sun and moon represent the character of the first words the infant lisps. In this department also the facts point to an infancy of the human race.

δ. Development of the Fine Arts.

IF we look at representation by drawing or sculpture, we find that the efforts of the earliest races of which we have any knowledge were quite similar to those which the untaught hand of infancy traces on its slate or the savage depicts on the rocky faces of hills. The circle or triangle for the head and body, and straight lines for the limbs, have been preserved as the first attempts of the men of the stone period, as they are to this day the sole representations of the human form which the North American Indian places on his buffalo robe or mountain precipice. The stiff, barely-outlined form of the deer, the turtle, etc., are literally those of the infancy of civilized man.

The first attempts at sculpture were marred by the influence of modism. Thus the idols of Coban and Palenque, with human faces of some merit, are overloaded with absurd ornament, and deformed into frightful asymmetry, in compliance with the demand of some imperious mode. In later days we have the stiff, conventionalized figures of the palaces of Nineveh and the temples of Egypt, where the representation of form has somewhat improved, but is too often distorted by false fashion or imitation of some unnatural standard, real or artistic. This is distinguished as the day of archaic sculpture, which disappeared with the Etruscan nation. So the drawings of the child, when he abandons the simple lines, are stiff and awkward, and but a stage nearer true representation; and how often does he repeat some peculiarity or absurdity of his own! So much easier is it to copy than to conceive.

The introduction of the action and pose of life into sculpture was not known before the early days of Greece, and it was there that the art was brought to perfection. When art rose from its mediæval slumber, much the same succession of development may be discovered. First, the stiff figures, with straightened limbs and cylindric drapery, found in the old Northern churches—then the forms of life that now adorn the porticoes and palaces of the cities of Germany.

ε. Rationale of the Development of Intelligence.

THE history of material development shows that the transition from stage to stage of development, experienced by the most perfect forms of animals and plants in their growth from the primordial cell, is similar to the succession of created beings which the geological epochs produced. It also shows that the slow assumption of main characters in the line of succession in early geological periods produced the condition of inferiority, while an increased rapidity of growth in later days has resulted in an attainment of superiority. It is not to be supposed that in "acceleration" the period of growth is shortened: on the contrary, it continues the same. Of two beings whose characters are assumed at the same rate of succession, that with the quickest or shortest growth is necessarily inferior. "Acceleration" means a gradual increase of the rate of assumption of successive characters in the same period of time. A fixed rate of assumption of characters, with gradual increase in the length of the period of growth, would produce the same result —viz., a longer developmental scale and the attainment of an advanced position. The first is in part the rela-

tion of sexes of a species; the last of genera, and of other types of creation. If from an observed relation of many facts we derive a law, we are permitted, when we see in another class of facts similar relations, to suspect that a similar law has operated, differing only in its objects. We find a marked resemblance between the facts of structural progress in matter and the phenomena of intellectual and spiritual progress.

If the facts entering into the categories enumerated in the preceding section bear us out, we conclude that in the beginning of human history the progress of the individual man was very slow, and that but little was attained to; that through the profitable direction of human energy, means were discovered from time to time by which the process of individual development in all metaphysical qualities has been accelerated; and that up to the present time the consequent advance of the whole race has been at an increasing rate of progress. This is in accordance with the general principle, that high development in intellectual things is accomplished by rapidity in traversing the preliminary stages of inferiority common to all, while low development signifies sluggishness in that progress, and a corresponding retention of inferiority.

How much meaning may we not see, from this stand-point, in the history of the intelligence of our little ones! First they crawl, they walk on all fours: when they first assume the erect position they are generally speechless, and utter only inarticulate sounds. When they run about, stones and dirt, the objects that first meet the eye, are the delight of their awakening powers, but these are all cast aside when the boy obtains his first jackknife. Soon, however, reading and writing open a new world to him; and finally as a mature man he seizes the forces of nature, and steam and electricity do his bidding in the active pursuit of power for still better and higher ends.

So with the history of the species: first the quadrumane — then the speaking man, whose humble industry was, however, confined to the objects that came first to hand, this being the "stone age" of pre-historic time. When the use of metals was discovered, the range of industries expanded wonderfully, and the "iron age" saw many striking efforts of human power. With the introduction of letters it became possible to record events and experiences, and the spread of knowledge was thereby greatly increased, and the delays and mistakes of ignorance correspondingly diminished in the fields of the world's activity.

From the first we see in history a slow advance as knowledge gained by the accumulation of tradition and by improvements in habit based on experience; but how slow was this advance while the use of the metals was still unknown! The iron age brought with it not only new conveniences, but increased means of future progress; and here we have an acceleration in the rate of advance. With the introduction of letters this rate was increased many fold, and in the application of steam we have a change equal in utility to any that has preceded it, and adding more than any to the possibilities of future advance in many directions. By it power, knowledge and means of happiness were to be distributed among the many.

The uses to which human intelligence has successively applied the materials furnished by nature have been—First, subsistence and defence: second, the accumulation of power in the shape of a representative of that labor which the use of matter involves; in other words, the accumulation of wealth. The possession of this power involves new possibilities, for opportunity is offered for the special pursuits of knowledge and the assistance of the weak or undeveloped part of mankind in its struggles.

Thus, while the first men possessed the power of speech, and could advance a little in knowledge through the accumulation of the experiences of their predecessors, they possessed no means of accumulating the power of labor, no

control over the activity of numbers—in other words, no wealth.

But the accumulation of knowledge finally brought this advance about. The extraction and utilization of the metals, especially iron, formed the most important step, since labor was thus facilitated and its productiveness increased in an incalculable degree. We have little evidence of the existence of a medium of exchange during the first or stone period, and no doubt barter was the only form of trade. Before the use of metals, shells and other objects were used: remains of money of baked clay have been found in Mexico. Finally, though in still ancient times, the possession of wealth in money gradually became possible and more common, and from that day to this avenues for reaching this stage in social progress have ever been opening.

But wealth merely indicates a stage of progress, since it is but a comparative term. All men could not become rich, for in that case all would be equally poor. But labor has a still higher goal; for, thirdly, as capital, it constructs and employs machinery, which does the work of many hands, and thus cheapens products, which is equivalent in effect to an accumulation of wealth to the consumer. And this increase of power may be used for the intellectual and spiritual advance of men, or otherwise, at the will of the men thus favored. Machinery places man in the position of a creator, operating on Nature through an increased number of "secondary causes."

Development of intelligence is seen, then, in the following directions: First, in the knowledge of facts, including science; second, in language; third, in the apprehension of beauty; and, as consequences of these, the accumulation of power by development—First, of means of subsistence; and second, of mechanical invention.

Thus we have two terms to start with in estimating the beginning of human development in knowledge and power: First, the primary capacities of the human mind itself; second, a material world, whose infinitely varied components are so arranged as to yield results to the energies of that mind. For example, the transition points of vaporization and liquefaction are so placed as to be within the reach of man's agents; their weights are so fixed as to accord with the muscular or other forces which he is able to exert; and other living organizations are subject to his convenience and rule, and not, as in previous geological periods, entirely beyond his control. These two terms being given, it is maintained that the present situation of the most civilized men has been attained through the operation of a law of mutual action and reaction—a law whose results, seen at the present time, have depended on the acceleration or retardation of its rate of action; which rate has been regulated, according to the degree in which a third great term, viz., the law of moral or (what is the same thing) true religious development has been combined in the plan. What it is necessary to establish in order to prove the above hypothesis is—

I. That in each of the particulars above enumerated the development of the human species is similar to that of the individual from infancy to maturity.

II. That from a condition of subserviency to the laws of matter, man's intelligence enables him, by an accumulation of power, to become in a sense independent of those laws, and to pursue a course of intellectual and spiritual progress.

III. That failure to accomplish a moral or spiritual development will again reduce him to a subserviency to the laws of matter.

This brings us to the subject of moral development. And here I may be allowed to suggest that the weight of the evidence is opposed to the philosophy, "falsely so called," of necessitarianism, which asserts that the first two terms alone were sufficient to work out man's salvation in this world and the next; and, on the other hand, to that anti-philosophy which asserts that all things in human progress, intellectual and

moral, are regulated by immediate Divine interposition instead of through instrumentalities. Hence the subject divides itself at once into two great departments — viz., that of the development of mind or intelligence, and that of the development of morality.

That these laws are distinct there can be no doubt, since in the individual man one of them may produce results without the aid of the other. Yet it can be shown that each is the most invaluable aid and stimulant to the other, and most favorable to the rapid advance of the mind in either direction.

EDWARD D. COPE.

ON THE HYPOTHESIS OF EVOLUTION, PHYSICAL AND METAPHYSICAL.

III.

III. SPIRITUAL OR MORAL DEVELOPMENT.

IN examining this subject, we first inquire (Sect. *a*) whether there is any connection between physical and moral or religious development; then (β), what indications of moral development may be derived from history. Finally (γ), a correlation of the results of these inquiries, with the nature of the religious development in the individual, is attempted. Of course in so stupendous an inquiry but a few leading points can be presented here.

If it be true that the period of human existence on the earth has seen a gradually increasing predominance of higher motives over lower ones among the mass of mankind, and if any parts of our metaphysical being have been derived by inheritance from pre-existent beings, we are incited to the inquiry whether any of the moral qualities are included among the latter; and whether there be any resemblance between moral and intellectual development.

Thus, if there have been a physical derivation from a pre-existent genus, and an embryonic condition of those physical characters which distinguish Homo — if there has been also an embryonic or infantile stage in intellectual qualities—we are led to inquire whether the development of the individual in moral nature will furnish us with a standard of estimation of the successive conditions or present relations of the human species in this aspect also.

a. Relations of Physical and Moral Nature.

ALTHOUGH, *cæteris paribus*, men are much alike in the deeper qualities of their nature, there is a range of variation which is best understood by a consideration of the extremes of such variation, as seen in men of different latitudes, and women and children.

(*a.*) *In Children.* Youth is distinguished by a peculiarity, which no doubt depends upon an immature condition of the nervous centre concerned, which might be called *nervous impressibility.* It is exhibited in a greater tendency to tearfulness, in timidity, less mental endurance, a greater facility in acquiring knowledge, and more ready susceptibility to the influence of sights, sounds and sensations. In both sexes the emotional nature predominates over the intelligence and judgment. In those years the *character* is said to be in embryo, and theologians in using the phrase, "reaching years of religious understanding," mean that in early years the religious *capacities* undergo development coincidentally with those of the body.

(*b.*) *In Women.* If we examine the metaphysical characteristics of women, we observe two classes of traits—namely, those which are also found in men, and those which are absent or but weakly developed in men. Those of the first class are very similar in essential nature to those which men exhibit at an early stage of development. This may be in some way related to the fact that physical maturity occurs earlier in women.

The gentler sex is characterized by a greater impressibility, often seen in the influence exercised by a stronger character, as well as by music, color or spectacle generally; warmth of emotion, submission to its influence rather than that of logic; timidity and irregularity of action in the outer world. All these qualities belong to the male sex, as a general rule, at some period of life, though different individuals lose them at very various periods. Ruggedness

and sternness may rarely be developed in infancy, yet at some still prior time they certainly do not exist in any.

Probably most men can recollect some early period of their lives when the emotional nature predominated — a time when emotion at the sight of suffering was more easily stirred than in their maturer years. I do not now allude to the benevolence inspired, kept alive or developed by the influence of the Christian religion on the heart, but rather to that which belongs to the natural man. Perhaps all men can recall a period of youth when they were hero-worshipers —when they felt the need of a stronger arm, and loved to look up to the powerful friend who could sympathize with and aid them. This is the "woman stage" of character: in a large number of cases it is early passed; in some it lasts longer; while in a very few men it persists through life. Severe discipline and labor are unfavorable to its persistence. Luxury preserves its bad qualities without its good, while Christianity preserves its good elements without its bad.

It is not designed to say that woman in her emotional nature does not differ from the undeveloped man. On the contrary, though she does not differ in kind, she differs greatly in degree, for her qualities grow with her growth, and exceed in *power* many fold those exhibited by her companion at the original point of departure. Hence, since it might be said that man is the undeveloped woman, a word of explanation will be useful. Embryonic types abound in the fields of nature, but they are not therefore immature in the usual sense. Maintaining the lower essential quality, they yet exhibit the usual results of growth in individual characters; that is, increase of strength, powers of support and protection, size and beauty. In order to maintain that the masculine character coincides with that of the undeveloped woman, it would be necessary to show that the latter during her infancy possesses the male characters predominating—that is, unimpressibility, judgment, physical courage, and the like.

If we look at the second class of female characters—namely, those which are imperfectly developed or absent in men, and in respect to which man may be called undeveloped woman—we note three prominent points: facility in language, tact or finesse, and the love of children. The first two appear to me to be altogether developed results of "impressibility," already considered as an indication of immaturity. Imagination is also a quality of impressibility, and, associated with finesse, is apt to degenerate into duplicity and untruthfulness — a peculiarity more natural to women than men.

The third quality is different. It generally appears at a very early period of life. Who does not know how soon the little girl selects the doll, and the boy the toy horse or machine? Here man truly never gets beyond undeveloped woman. Nevertheless, "impressibility" seems to have a great deal to do with this quality also.

Thus the metaphysical relation of the sexes would appear to be one of *inexact parallelism*, as defined in Sect. I. That the physical relation is a remote one of the same kind, several characters seem to point out. The case of the vocal organs will suffice. Their structure is identical in both sexes in early youth, and both produce nearly similar sounds. They remain in this condition in the woman, while they undergo a metamorphosis and change both in structure and vocal power in the man. In the same way, in many of the lower creation, the females possess a majority of embryonic features, though not invariably. A common example is to be found in the plumage of birds, where the females and young males are often undistinguishable.* But there are few

*Meehan states that the upper limbs and strong laterals in coniferæ and other trees produce female flowers and cones, and the lower and more interior branches the male flowers. He calls the former condition one of greater "vigor," and the latter one of "weakness," and argues that the vigorous condition of growth produces females, and the weaker males. What he points out, however, is in harmony with the position here maintained—namely, that the female characters include more of those which are embryonic in the males than the male characters include of

points in the physical structure of man also in which the male condition is the immature one. In regard to structure, the point at which the relation between the sexes is that of *exact parallelism*, or where the mature condition of the one sex accords with the undeveloped condition of the other, is when reproduction is no longer accomplished by budding or gemmation, but requires distinct organs. Metaphysically, this relation is to be found where distinct individuality of the sexes first appears; that is, where we pass from the hermaphrodite to the bisexual condition.

But let us put the whole interpretation on this partial undevelopment of woman.

The types or conditions of organic life which have been the most prominent in the world's history—the Ganoids of the first, the Dinosaurs of the second, and the Mammoths of the third period—have generally died with their day. The line of succession has not been from them. The law of anatomy and paleontology is, that we must seek the point of departure of the type which is to predominate in the future, at lower stages on the line, in less decided forms, or in what, in scientific parlance, are called generalized types. In the same way, though the adults of the tailless apes are in a physical sense more highly developed than their young, yet the latter far more closely resemble the human species in their large facial angle and shortened jaws.

How much significance, then, is added to the law uttered by Christ!—"Except ye become as little children, ye cannot enter the kingdom of heaven." Submission of will, loving trust, confiding faith—these belong to the child: how strange they appear to the executing, commanding, reasoning man! Are they so strange to the woman? We all know the answer. Woman is nearer to the point of departure of that development which outlives time and which peoples heaven; and if man would find it, he must retrace his steps, regain something he lost in youth, and join to the powers and energies of his character the submission, love and faith which the new birth alone can give.

Thus the summing up of the metaphysical qualities of woman would be thus expressed: In the emotional world, man's superior; in the moral world, his equal; in the laboring world, his inferior.

There are, however, vast differences in women in respect to the number of masculine traits they may have assumed before being determined into their own special development. Woman also, under the influence of necessity, in later years of life, may add more or less to those qualities in her which are fully developed in the man.

The relation of these facts to the principles stated as the two opposing laws of development is, it appears to me, to be explained thus: First, that woman's most inherent peculiarities are *not* the result of the external circumstances with which she has been placed in contact, as the *conflict theory* would indicate. Such circumstances are said to be her involuntary subserviency to the physically more powerful man, and the effect of a compulsory mode of life in preventing her from attaining a position of equality in the activities of the world. Second, that they *are* the result of the different distributions of qualities as already indicated by the *harmonic theory* of development; that is, of the unequal possession of features which belong to different periods in the developmental succession of the highest. There is then another beautiful harmony which will ever remain, let the development of each sex be extended as far as it may.

(*c.*) *In Men.* If we look at the male sex, we shall find various exceptional

those which are embryonic in the female: the female flowers are the product of the younger and more growing portions of the tree—that is, those last produced (the upper limbs and new branches)—while the male flowers are produced by the older or more mature portions—that is, lower limbs or more axial regions. Further, we are not accustomed to regard the condition of rapid growth as that of great vigor in animals, but rather ascribe that quality to maturity, after such growth has ceased.

Meehan's observations coincide with those of Thury and others on the origin of sexes in animals and plants, which it appears to me admit of a similar explanation.

approximations to the female in mental constitution. Further, there can be little doubt that in the Indo-European race maturity in some respects appears earlier in tropical than in northern regions; and though subject to many exceptions, this is sufficiently general to be looked upon as a rule. Accordingly, we find in that race—at least in the warmer regions of Europe and America—a larger proportion of certain qualities which are more universal in women; as greater activity of the emotional nature when compared with the judgment; an impressibility of the nervous centre, which, *cæteris paribus*, appreciates quickly the harmonies of sound, form and color; answers most quickly to the friendly greeting or the hostile menace; is more careless of consequences in the material expression of generosity or hatred, and more indifferent to truth under the influence of personal relations. The movements of the body and expressions of the countenance answer to the temperament. More of grace and elegance in the bearing marks the Greek, the Italian and the Creole, than the German, the Englishman or the Green Mountain man. More of vivacity and fire, for better or for worse, is displayed in the countenance.

Perhaps the more northern type left all that behind in its youth. The rugged, angular character which appreciates force better than harmony, the strong intellect which delights in forethought and calculation, the less impressibility, reaching stolidity in the uneducated, are its well-known traits. If there be in such a character less generosity and but little chivalry, there is persistency and unwavering fidelity, not readily obscured by the lightning of passion or the dark surmises of an active imagination.

All these peculiarities appear to result, *first*, from different degrees of quickness and depth in appreciating impressions from without; and, *second*, from differing degrees of attention to the intelligent judgment in consequent action. (I leave conscience out, as not belonging to the category of inherited qualities.)

The first is the basis of an emotional nature, and the predominance of the second is the usual indication of maturity. That the first is largely dependent on an impressible condition of the nervous system can be asserted by those who reduce their nervous centres to a sensitive condition by a rapid consumption of the nutritive materials necessary to the production of thought-force, and perhaps of brain tissue itself, induced by close and prolonged mental labor. The condition of overwork, though but an imitation of immaturity, without its joy-giving nutrition, is nevertheless very instructive. The sensitiveness, both physically, emotionally and morally, is often remarkable, and a weakening of the understanding is often coincident with it.

The above observations have been confined to the Indo-European race. It may be objected to the theory that savagery means immaturity in the senses above described, as dependent largely on "impressibility," while savages in general display the least "impressibility," as that word is generally understood. This cannot be asserted of the Africans, who, so far as we know them, possess this peculiarity in a high degree. Moreover, it must be remembered that the state of indifference which precedes that of impressibility in the individual may characterize many savages; while their varied peculiarities may be largely accounted for by recollecting that many combinations of different species of emotions and kinds of intelligence go to make up the complete result in each case.

(*d.*) *Conclusions.* Three types of religion may be selected from the developmental conditions of man: first, an absence of sensibility (early infancy); second, an emotional stage more productive of faith than of works; thirdly, an intellectual type, more favorable to works than to faith. Though in regard to responsibility these states may be equal, there is absolutely no gain to laboring humanity from the first type,

and a serious loss in actual results from the second, taken alone, as compared with the third.

These, then, are the *physical vehicles of religion*—if the phrase may be allowed—which give character and tone to the deeper spiritual life, as the color of the transparent vessel is communicated to the light which radiates from within.

But if evolution has taken place, there is evidently a provision for the progress from the lower to the higher states, either in the education of circumstances ("conflict"), or in the power of an interior spiritual influence ("harmony"), or both.

β. Evidence Derived from History.

WE trace the development of Morality in—First, the family or social order; second, the civil order, or government.

Whatever may have been the extent of moral ignorance before the Deluge, it does not appear that the earth was yet prepared for the permanent habitation of the human race. All nations preserve traditions of the drowning of the early peoples by floods, such as have occurred frequently during geologic time. At the close of each period of dry land, a period of submergence has set in, and the depression of the level of the earth, and consequent overflow by the sea, has caused the death and subsequent preservation of the remains of the fauna and flora living upon it, while the elevation of the same has produced that interruption in the process of deposit in the same region which marks the intervals between geologic periods. Change in these respects does not occur to any very material extent at the present time in the regions inhabited by the most highly developed portions of the human race; and as the last which occurred seems to have been expressly designed for the preparation of the earth's surface for the occupation of organized human society, it may be doubted whether many such changes are to be looked for in the future. The last great flooding was that which stratified the drift materials of the north, and carried the finer portions far over the south, determining the minor topography of the surface and supplying it with soils.

The existence of floods which drowned many races of men may be considered as established. The men destroyed by the one recorded by Moses are described by him as exceedingly wicked, so that "the earth was filled with violence." In his eyes the Flood was designed for their extermination.

That their condition was evil must be fully believed if they were condemned by the executive of the Jewish law. This law, it will be remembered, permitted polygamy, slavery, revenge, aggressive war. The Jews were expected to rob their neighbors the Egyptians of jewels, and they were allowed "an eye for an eye and a tooth for a tooth." They were expected to butcher other nations, with their women and children, their flocks and their herds. If we look at the lives of men recorded in the Old Testament as examples of distinguished excellence, we find that their standard, however superior to that of the people around them, would ill accord with the morality of the present day. They were all polygamists, slaveholders and warriors. Abraham treated Hagar and Ishmael with inhumanity. Jacob, with his mother's aid, deceived Isaac, and received thereby a blessing which extended to the whole Jewish nation. David, a man whom Paul tells us the Lord found to be after his own heart, slew the messenger who brought tidings of the death of Saul, and committed other acts which would stain the reputation of a Christian beyond redemption. It is scarcely necessary to turn to other nations if this be true of the chosen men of a chosen people. History indeed presents us with no people prior to, or contemporary with, the Jews who were not morally their inferiors.

If we turn to more modern periods, an examination of the morality of Greece and Rome reveals a curious intermixture of lower and higher moral conditions. While each of these nations produced excellent moralists, the influence of their teachings was not sufficient to elevate the masses above what

would now be regarded as a very low standard. The popularity of those scenes of cruelty, the gladiatorial shows and the combats with wild beasts, sufficiently attests this. The Roman virtue of patriotism, while productive of many noble deeds, is in itself far from being a disinterested one, but partakes rather of the nature of partisanship and selfishness. If the Greeks were superior to the Romans in humanity, they were apparently their inferiors in the social virtues, and were much below the standard of Christian nations in both respects.

Ancient history points to a state of chronic war, in which the social relations were ever in confusion, and the development of the useful arts was almost impossible. Savage races, which continue to this day in a similar moral condition, are, we may easily believe, most unhappy. They are generally divided into tribes, which are mutually hostile, or friendly only with the view of injuring some other tribe. Might is their law, and robbery, rapine and murder express their mutual relations. This is the history of the lowest grade of barbarism, and the history of primeval man so far as it has come down to us in sacred and profane records. Man as a species first appears in history as a sinful being. Then a race maintaining a contest with the prevailing corruption and exhibiting a higher moral ideal is presented to us in Jewish history. Finally, early Christian society exhibits a greatly superior condition of things. In it polygamy scarcely existed, and slavery and war were condemned. But progress did not end here, for our Lord said, "I have yet many things to say unto you, but ye cannot bear them now. Howbeit, when He, the spirit of truth, is come, He will guide you into all truth."

The progress revealed to us by history is truly great, and if a similar difference existed between the first of the human species and the first of whose condition we have information, we can conceive how low the origin must have been. History begins with a considerable progress in civilization, and from this we must infer a long preceding period of human existence, such as a gradual evolution would require.

γ. *Rationale of Moral Development.*

I. *Of the Species.* Let us now look at the moral condition of the infant man of the present time. We know his small accountability, his trust, his innocence. We know that he is free from the law that when he "would do good, evil is present with him," for good and evil are alike unknown. We know that until growth has progressed to a certain degree he fully deserves the praise pronounced by Our Saviour, that "of such is the kingdom of heaven." Growth, however, generally sees a change. We know that the buddings of evil appear but too soon: the lapse of a few months sees exhibitions of anger, disobedience, malice, falsehood, and their attendants—the fruit of a corruption within not manifested before.

In early youth it may be said that moral susceptibility is often in inverse ratio to physical vigor. But with growth the more physically vigorous are often sooner taught the lessons of life, for their energy brings them into earlier conflict with the antagonisms and contradictions of the world. Here is a beautiful example of the benevolent principle of compensation.

1. *Innocence and the Fall.* If physical evolution be a reality, we have reason to believe that the infantile stage of human morals, as well as of human intellect, was much prolonged in the history of our first parents. This constitutes the period of human purity, when we are told by Moses that the first pair dwelt in Eden. But the growth to maturity saw the development of all the qualities inherited from the irresponsible denizen of the forest. Man inherits from his predecessors in the creation the buddings of reason: he inherits passions, propensities and appetites. His corruption is that of his animal progenitors, and his sin is the low and bestial instinct of the brute creation. Thus only is the origin of sin made

clear—a problem which the pride of man would have explained in any other way had it been possible.

But how startling the exhibition of evil by this new being as compared with the scenes of the countless ages already past! Then the right of the strongest was God's law, and rapine and destruction were the history of life. But into man had been "breathed the breath of life," and he had "become a living soul." The law of right, the Divine Spirit, was planted within him, and the laws of the beast were in antagonism to that law. The natural development of his inherited qualities necessarily brought him into collision with that higher standard planted within him, and that war was commenced which shall never cease "till He hath put all things under his feet." The first act of man's disobedience constituted the Fall, and with it would come the first *intellectual* "knowledge of good and of evil"—an apprehension up to that time derived exclusively from the divinity within, or conscience.*

2. *Free Agency.* Heretofore development had been that of physical types, but the Lord had rested on the seventh day, for man closed the line of the physical creation. Now a new development was to begin—the development of mind, of morality and of grace.

On the previous days of Creation all had progressed in accordance with inevitable law apart from its objects. Now two lines of development were at the disposal of this being, between which his *free will* was to choose. Did he choose the courses dictated by the spirit of the brute, he was to be subject to the old law of the brute creation—the right of the strongest and spiritual death. Did he choose the guidance of the Divine Guest in his heart, he became subject to the laws which are to guide—I. the human species to an ultimate perfection, so far as consistent with this world; and II. the individual man to a higher life, where a new existence awaits him as a spiritual being, freed from the laws of terrestrial matter.

The charge brought against the theory of development, that it implies a necessary progress of man to all perfection without his co-operation—or *necessitarianism*, as it is called—is unfounded.

The free will of man remains the source alike of his progress and his relapse. But the choice once made, the laws of spiritual development are apparently as inevitable as those of matter. Thus men whose religious capacities are increased by attention to the Divine Monitor within are in the advance of progress—progress coinciding with that which in material things is called the *harmonic*. On the other hand, those whose motives are of the lower origin fall under the working of the law of *conflict*.

The lesson derivable from the preceding considerations would seem to be "necessitarian" as respects the whole human race, considered by itself; and I believe it is to be truly so interpreted. That is, the Creator of all things has set agencies at work which will slowly develop a perfect humanity out of His lower creation, and nothing can thwart the process or alter the result. "My word shall not return unto Me void, but it shall accomplish that which I please, and it shall prosper in the thing whereto I sent it." This is our great encouragement, our noblest hope—second only to that which looks to a blessed inheritance in another world. It is this thought that should inspire the farmer, who as he toils wonders, "Why all this labor? The Good Father could have made me like the lilies, who, though they toil not, neither spin, are yet clothed in glory; and why should I, a nobler being, be subject to the dust and

* In our present translation of Genesis, the Fall is ascribed to the influence of Satan assuming the form of the serpent, and this animal was cursed in consequence, and compelled to assume a prone position. This rendering may well be revised, since serpents, prone like others, existed in both America and Europe during the Eocene epoch, five times as great a period before Adam as has elapsed since his day. Clark states, with great probability, that "serpent" should be translated monkey or ape—a conclusion, it will be observed, exactly coinciding with our inductions on the basis of evolution. The instigation to evil by an ape merely states inheritance in another form. His curse, then, refers to the retention of the horizontal position retained by all other quadrumana, as we find it at the present day.

the sweat of labor?" This thought should enlighten every artisan of the thousands that people the factories and guide their whirling machinery in our modern cities. Every revolution of a wheel is moving the car of progress, and the timed stroke of the crank and the rhythmic throw of the shuttle are but the music the spheres have sung since time began. A new significance then appears in the prayer of David: "Let the beauty of the Lord our God be upon us, and establish Thou the work of our hands upon us: the work of our hands, O Lord, establish Thou it." But beware of the catastrophe, for "He will sit as a refiner:" "the wheat shall be gathered into barns, but the chaff shall be burned with unquenchable fire." If this be true, let us look for—

3. *The Extinction of Evil.* How is necessitarianism to be reconciled with free will? It appears to me, thus: When a being whose safety depends on the perfection of a system of laws abandons the system by which he lives, he becomes subject to that lower grade of laws which govern lower intelligences. Man, falling from the laws of right, comes under the dominion of the laws of brute force; as said our Saviour: "Salt is good, but if the salt have lost his savor, it is thenceforth good for nothing but to be cast forth and trodden under foot of men."

In estimating the practical results to man of the actions prompted by the lower portion of our nature, it is only necessary to carry out to its full development each of those animal qualities which may in certain states of society be restrained by the social system. In human history those qualities have repeatedly had this development, and the battle of progress is fought to decide whether they shall overthrow the system that restrains them, or be overthrown by it.

Entire obedience to the lower instincts of our nature ensures destruction to the weaker, and generally to the stronger also. A most marked case of this kind is seen where the developed vices of civilization are introduced among a savage people—as, for example, the North American Indians. These seem in consequence to be hastening to extinction.

But a system or a circuit of existence has been allotted to the civil associations of the animal species man, independently of his moral development. It may be briefly stated thus: Races begin as poor offshoots or emigrants from a parent stock. The law of labor develops their powers, and increases their wealth and numbers. These will be diminished by their various vices; but on the whole, in proportion as the intellectual and economical elements prevail, wealth will increase; that is, they accumulate power. When this has been accomplished, and before activity has slackened its speed, the nation has reached the culminating point, and then it enters upon the period of decline. The restraints imposed by economy and active occupation being removed, the beastly traits find in accumulated power only increased means of gratification, and industry and prosperity sink together. Power is squandered, little is accumulated, and the nation goes down to its extinction amid scenes of internal strife and vice. Its cycle is soon fulfilled, and other nations, fresh from scenes of labor, assault it, absorb its fragments, and it dies. This has been the world's history, and it remains to be seen whether the virtues of the nations now existing will be sufficient to save them from a like fate.

Thus the history of the animal man in nations is wonderfully like that of the types or families of the animal and vegetable kingdoms during geologic ages. They rise, they increase and reach a period of multiplication and power. The force allotted to them becoming exhausted, they diminish and sink and die.

II. *Of the Individual.* In discussing physical development, we are as yet compelled to restrict ourselves to the evidence of its existence and some laws observed in the operation of its causative force. What that force is, or what are its primary laws, we know not.

So in the progress of moral development we endeavor to prove its existence and the mode of its operation, but why that mode should exist, rather than some other mode, we cannot explain.

The moral progress of the species depends, of course, on the moral progress of the individuals embraced in it. Religion is the sum of those influences which determine the motives of men's actions into harmony with the Divine perfection and the Divine will.

Obedience to these influences constitutes the practice of religion, while the statement of the growth and operation of these influences constitutes the theory of religion, or doctrine.

The Divine Spirit planted in man shows him that which is in harmony with the Divine Mind, and it remains for his free will to conform to it or reject it. This harmony is man's highest ideal of happiness, and in seeking it, as well as in desiring to flee from dissonance or pain, he but obeys the disposition common to all conscious beings. If, however, he attempts to conform to it, he will find the law of evil present, and frequently obtaining the mastery. If now he be in any degree observing, he will find that the laws of morality and right are the only ones by which human society exists in a condition superior to that of the lower animals, and in which the capacities of man for happiness can approach a state of satisfaction. He may be then said to be "awakened" to the importance of religion. If he carry on the struggle to attain to the high goal presented to his spiritual vision, he will be deeply grieved and humbled at his failures: then he is said to be "convicted." Under these circumstances the necessity of a deliverance becomes clear, and is willingly accepted in the only way in which it has pleased the Author of all to present it, which has been epitomized by Paul as "the washing of regeneration and renewal of the Holy Spirit through Jesus Christ." Thus a life of advanced and ever-advancing moral excellence becomes possible, and the man makes nearer approaches to the "image of God."

Thus is opened a new era in spiritual development, which we are led to believe leads to an ultimate condition in which the nature inherited from our origin is entirely overcome, and an existence of moral perfection entered on. Thus in the book of Mark the simile occurs: "First the blade, then the ear, after that the full corn in the ear;" and Solomon says that the development of righteousness "shines more and more unto the perfect day."

δ. Summary.

IF it be true that general development in morality proceeds in spite of the original predominance of evil in the world, through the self-destructive nature of the latter, it is only necessary to examine the reasons why the excellence of the good may have been subject also to progress, and how the remainder of the race may have been influenced thereby.

The development of morality is then probably to be understood in the following sense: Since the Divine Spirit, as the prime force in human progress, cannot in itself be supposed to have been in any way under the influence of natural laws, its capacities were no doubt as eternal and unerring in the first man as in the last. But the facts and probabilities discussed above point to development of *religious sensibility*, or capacity to appreciate moral good, or to receive impressions from the source of good.

The evidence of this is supposed to be seen in—*First*, improvement in man's views of his duty to his neighbor; and *Second*, the substitution of spiritual for symbolic religions: in other words, improvement in the capacity for receiving spiritual impressions.

What the primary cause of this supposed development of religious sensibility may have been, is a question we reverently leave untouched. That it is intimately connected in some way with, and in part dependent on, the evolution of the intelligence, appears very probable:

for this evolution is seen — *First*, in a better understanding of the consequences of action, and of good and of evil in many things; and *Second*, in the production of means for the spread of the special instrumentalities of good. The following may be enumerated as such instrumentalities:

1. Furnishing literary means of record and distribution of the truths of religion, morality and science.

2. Creating and increasing modes of transportation of teachers and literary means of disseminating truth.

3. Facilitating the migration and the spread of nations holding the highest position in the scale of morality.

4. The increase of wealth, which multiplies the extent of the preceding means.

And now, let no man attempt to set bounds to this development. Let no man say even that morality accomplished is all that is required of mankind, since that is not necessarily the evidence of a spiritual development. If a man possess the capacity for progress beyond the condition in which he finds himself, in refusing to enter upon it he declines to conform to the Divine law. For "from those to whom little is given, little is required, but from those to whom much is given, much shall be required."

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