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THE RELIGIOUS ASPECT

OF

EVOLUTION

BY

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PREFATORY NOTE TO SECOND EDITION.

This work was first published as one of the Bedell Lectures, founded by the Rev. Dr. Bedell, Bishop of Ohio, and Mrs. Bedell. In issuing this second edition in a somewhat different form, I have inserted a chapter on "Final Cause," and used materials from Dr. A. R. Wallace's recently published work on "Darwinism."

PREFACE.

In my first published work, "The Method of Divine Government," I sought to unfold the plan by which God governs the world, and I found it to be in an orderly manner—that is, by law. As having pursued this line of research, I was prepared to believe that there might be the like method in the organic kingdoms, and to listen to Darwin when he showed that there was a regular instrumentality in the descent of plants and animals. I noticed that he and others, such as Lewes, Huxley, and Spencer, who took the same view, were not swayed by any religious considerations, and that religious people generally were strongly prepossessed against the new doctrine. But I saw, at the same time, that Darwin was a most careful observer, that he published many important facts, that there was great truth in the theory, and that there was nothing atheistic in it if properly understood—that is, in the ac-

knowledged tenet of the government of organic nature by means and according to law.

I felt it to be my only course not to reject the truth because it was proclaimed by some who turned it to an irreligious use, but to accept it wherever it might lead, and to turn it to a better use. I let it be known that while I thought there was truth, I believed there was error in the common expositions of evolution, and that the work of the coming age must be to separate the truth from the error, when it would be found, I was sure, that this, like every other part of God's work, would illustrate his existence and his wisdom.

When I was called from the Old World to the office which I now hold as president of an important college, I had to consider—I remember seriously pondering the question in the vessel which brought me to this country—whether I should at once avow my convictions or keep them in abeyance because of the prejudices of religious men, and lest I might unsettle the faith of the students committed to my care. I decided to pursue the open and honest course, as being sure that it would be the best in the end. I was not a week in Princeton till I let it be known to the upper classes

of the college that I was in favor of evolution properly limited and explained; and I have proclaimed my views in lectures and papers in a number of cities and before various associations, literary and religious. I have been gratified to find that none of the churches has assailed me, and this has convinced me that their doubts about evolution have proceeded mainly from the bad use to which the doctrine has been turned. I am pleased to discover that intelligent Christians are coming round gradually to the views which I have had the courage to publish.

I have all along had a sensitive apprehension that the undiscriminating denunciation of evolution from so many pulpits, periodicals, and seminaries might drive some of our thoughtful young men to infidelity, as they clearly saw development everywhere in nature, and were at the same time told by their advisers that they could not believe in evolution and yet be Christians. I am gratified beyond measure to find that I am thanked by my pupils, some of whom have reached the highest position as naturalists, because in showing them evolution in the works of God, I showed them that this was not inconsistent with reli-

gion, and thus enabled them to follow science and yet retain their faith in the Bible.[1]

[1] As I am a mere amateur naturalist (at one time a very enthusiastic one) I have laid these papers before my former pupils, now eminent naturalists, Dr. Macloskie, Professor of Natural History, Dr. Scott, Professor of Geology, Dr. Osborn, Professor of Comparative Anatomy, in Princeton College, and accepted their corrections. I have made use of the able works of Dana, LeConte, and Geikie on geology; also of Dawson's "Story of the Earth and Man," of Cope's "Origin of the Fittest," of Conn's "Evolution of To-day," and of Wallace's "Darwinism."

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CHAPTER I.

THE STATE OF THE QUESTION.

I.

EVOLUTION AND CAUSATION.—Evolution, the drawing of one thing out of another, is deep in nature. It proceeds from causation, which is universal. In the world things are so connected that every one thing proceeds from some other, and all things from God. This arises from the universal action of causation. A cause (in physical nature) develops into an effect, and an effect is an evolution from a cause. The All-Mighty God, in all his works, might have acted immediately—that is, without any creature instrumentality. He might have produced crops and cattle, heaved up mountains and lowered plains, determined birth and death without the use of means of any kind. But in this case I do not see how mankind, with their present faculties, could have anticipated any of these occurrences, as it is only by the preparations for them that we

know that they are coming. God has been pleased to arrange instead that every physical event has a physical cause,—the only exception being the miracles of the Old and New Testaments, which serve their purpose because they are exceptions. Causation is universal in physical nature, and causation develops all we see, or, to express it otherwise, all that we see is evolved from causes. We shall see that the evolution of plants and animals is produced by organized causes.

II.

Nature of Causation.—I do not mean to enter into the deep discussions on this subject. We know a little more of causation in these later years. All natural causation is produced by two or more bodies acting on each other, the effect being that both are changed. A ball in motion strikes a ball at rest; this constitutes the cause, and the effect is that the ball in motion is stayed, and the ball at rest moves, the two constituting the effect. It has to be added that heat is produced by the impact, being part of the effect. A stone strikes a board; this is the cause, and the effect is the stone arrested in its course and the board broken. Cold air blows on a

living plant; this is the cause, and the effect is the temperature of the air insensibly affected and the plant killed. Causes always consist of two or more agents called concauses; effects consist of the same agents changed. The effects, which are also dual or plural, are ready with other agents to act as causes. Nature thus becomes reticulated and flexible. The evolution of living beings is an organized causation.

III.

Development in Nature.—Suppose that nature, as created by God at the beginning, consists of a hundred or a thousand agents. These act upon each other according to their properties, and new products are ever appearing. There can be no impropriety in saying that they are evolved from their antecedents, which have the power of developing them. A complex effect is the evolution of a complexity of causes—say the downfall of the Roman empire, or the Renaissance of the fifteenth century. Such is God's method of distributing causes throughout the cosmos. It is our business not to rebel against the plan, but to fall in with it and profit by it. We can so far see its beneficial tendency. Looking to the

causes operating, we can from the present so far find out the past and forecast the future. We can take advantage of these causes and combinations of causes to develop the results, general and special, which we wish to accomplish. Limited though our view be, we can see that the method is worthy of God, and suited to the intelligence of man. We sow in spring because we know that the seed will produce fruit in harvest.

We are all familiar with organic development, though we may not have been giving it this formidable name. We are privileged to be descended from parents. Of mature age, I know that I am developed from the boy of six as I remember him going to school. Our horses, our cattle, and dogs are of a breed which can be determined. The bread we eat sprang from seed. We do not complain of these evolutions; we do not denounce them as atheistic. We are grateful for some of them; as, for example, that we have been nursed by a mother's love and watched over by a father's care. The new evolutions of plants and animal races which we are now called to consider, may only be a farther evolution of the old ones. Possibly the one set

may be no more atheistic than the others. Both may be illustrations of Divine method, of which we can so far see the wisdom.

IV.

THE QUESTION BETWEEN EVOLUTIONISTS AND NON-EVOLUTIONISTS.—"No man can find out the work that God maketh from the beginning to the end." But though human science cannot go back to the beginning nor go on to the end, and while there is much in the middle that is concealed, there are whole provinces which we can inquire into and come to know. "We know in part." We now know not a little about the generation of our earth, and of the plants and animals upon its surface. And we can tell much about the order in which animated beings appeared. But there is a keen dispute as to how they were produced.

All admit that there is system in the production of the organic world. Those who have no faith in a power above nature, ascribe it to physical forces. Religious people, so far from denying this, should at once admit and proclaim it; and seek to find out what the forces are and the laws they follow. We cannot allow God to be separated from his works, and so we must resolutely hold that God is in the

forces arranged into an order—that is, laws, which we find it so interesting to observe.

But this is not just the burning question of the day. There is a perplexing confusion in the statement of the question. It has been misunderstood by religious, it has been perverted by irreligious, people. The former often speak of it as being: Whether all things are to be ascribed to God, or a portion to God, while the rest is handed over to material agency? In maintaining this latter view they furnish an excuse or pretext to those who would ascribe the descent of plants and animals to mechanical agency. The great body of naturalists, all younger than forty, certainly all younger than thirty, are sure that they see evolution in nature; but they are assured by their teachers or the religious press that, if evolution does every thing, there is nothing left for God to do, and they see no proof of his existence. Many a youth is brought to a crisis in his belief and life by such a representation. He feels that he must give up either his science or his faith, and his head is distracted, and his heart is tortured till feelings more bitter than tears are wrung from it.

The question is said to be, Whether the

origin of species and descent of living creatures are by supernatural power or natural law, by Creator or creative action, by design or by mechanism, by contrivance or by chance, by purpose or without purpose.

Mr. Darwin, followed by Dr. Romanes, and many others, is constantly drawing the distinction in this form: between "natural selection" and "supernatural design," between "natural law" and "special creation." Now the difference between the two opposing theories as thus put is misleading, and this whether put by disbelief or by belief. The supernatural power is to be recognized in the natural law. The Creator's power is executed by creature action. The design is seen in the mechanism. Chance is obliged to vanish because we see contrivance. There is purpose when we see a beneficent end accomplished. Supernatural design produces natural selection. Special creation is included in universal creation.

A question is often settled by being properly stated. The *status quæstionis*, as the scholastics expressed it, is here not between God and not-God, but between God working without means and by means, the means being created by God and working for him. There may be

evidence of design, of contrivance, and purpose in the very means employed. If an optician brings me a microscope I have only to examine it to discover design in it, but I may have as clear proof of purpose when I visit his shop and see him manufacturing the instrument. There is nothing atheistic in the creed that God proceeds by instruments, which we may find to be for the good of his creatures. There may be a want of reverence toward God and truth when there is evidence laid before us in its favor and we refuse to look at it. I should discover God in the human frame, on the supposition that he created it at once, but I have quite as satisfactory evidence on the supposition that he produced it by a father and mother, and provided that it should grow to maturity by a natural process. In the geological development I am privileged as it were to enter God's workshop and see his modes of operation, and the result reached so full of provisions in bones, muscles, joints, for the good of the creature.

V.

TENDENCY OF A SET OF CAUSES TO DIFFERENTIATE AND INTEGRATE.—Our cosmic system consists of a number of elements, supposed at

present to be seventy, and of the properties possessed by them, such as gravitating, mechanical, and chemical power; these with an order or collocation imposed on them by God at the beginning. As they begin to act, which they do by their very nature as imparted to them by God, they differentiate. Things conjoined separate, complexities being dissolved by some of the composites having greater affinities to other things. There commence at the same time integrations; and new combinations are formed by gravitation, by chemical affinity, and other powers. These two processes are continually going on. At last, however, many integrations become fixed, so that they never change. Some have supposed that carbon is not an element, but a compound which cannot be dissolved in ordinary circumstances. Thus sea and land are distributed, mountains and rocks are formed, lakes and rivers are spread out. If organisms are ruled, as they undoubtedly are, by the law of cause and effect, there must be a like variation and conservation in their actions.

VI.

Uniformity with Variations in Organisms.—Plants and animals are the result of

combinations, being composed of oxygen, hydrogen, carbon, and nitrogen, the elements which form the most stable combinations, with a few others not so universally present. These are made, always by the power of God, to differentiate and combine into divisions, which are appropriately called Kinds. There are classes which are entitled to be called Natural; such, for example, is the division into fishes, amphibians, reptiles, birds, and mammals. The resemblance in the objects in the Kind is produced by their being of the same composition, but mainly from their being descended from a seed or germ which is a concentrated combination of powers. While there is a sameness there is also a variation. This may be produced by the mutual action of the elements within the organism itself. It is thus, for example, that old age and death are brought upon living beings. But the most conspicuous agent is what is called Environment. Every object has surroundings which act upon it. A fertile soil makes a plant grow and expand, while a barren soil dwarfs it.

VII.

Classification by Ramification.—The classification of organisms is not now made as it

used to be—by concentric circles within circles, genera within orders, and species within genera—but rather by ramification, with trunk and branches, branchlets, twigs, and leaves. So in the vegetable and animal systems we have common stock, and proceeding from it SUB-KINGDOMS, CLASSES, FAMILIES, ORDERS, GENERA, and SPECIES. This is the common division now of the vegetable and animal kingdoms. It shows us one system with means to produce it. Since the days of Aristotle, plants and animals have been classified according to type. It is thus that the great Cuvier has arranged the animal kingdom. The types have been fondly contemplated and admired by our profounder minds. They have been identified with the grand Ideas which, according to Plato, have been in or before the Divine mind from all eternity. Pious minds in modern times have ascribed them to God, whose thoughts are embodied in them. On the other hand the great rival of Cuvier, St. Hilaire, ascribed the types to a common descent, and used language which sounded as if the animal, by its wishes, could add to its organs ; could call forth fins to swim with, and wings to fly. The controversy came to a head in 1830, when Goethe declared that it was of

more importance than the French Revolution, which was at that time ringing in the ears of Europe. There is undoubtedly a difference between the two views; but may there not be a reconciliation? It may be by descent that types are formed, and yet all be done by a plan in the Divine wisdom which is thus manifested. The two great Swiss-American naturalists, Agassiz and Guyot, delighted to perceive clearly that there was a system in the descent of animals which they were sure was conceived in the Divine mind, but doubted whether it could have been produced by natural law or material agency. But surely, in analogy with the Divine procedure in all other parts of nature, we may discover a Divine plan, and at the same time a creature agency to carry it out, which agency makes known God's plan to us. We may see that the relations which constitute types are genetic, and as we perceive in them wisdom and beauty, we can also perceive that they are instituted by God. This view gives to classes a connection in the very nature of things, and makes species intelligible to human intelligence, which thereby rises to some comprehension of Divine intelligence, in the image of which human intelligence is formed.

VIII.

CONTINUANCE AND DISAPPEARANCE OF SPECIES.—In some cases the genera and species of plants and animals are unchanged for thousands or even millions of years. As instances we may mention the Trilobites, which appear in the Cambrian and remain till the Carboniferous epoch, when they disappear. The small bivalve shell, the Lingula, and the Nautilus can be traced back in a line to the earliest animal ages. So can some of the earthworms which have been busy in forming a soil for us. We may point also to the Ferns which present themselves in the Old Red Sandstone and the Coal Measures, and adorn our fields and uplands at this day. The fossil scorpions, found in Scotland and Gothland, are the same as those of our day. As illustrations of a different kind of the same continuance, we may refer to the figures of negroes on the monuments of Egypt, identical with the forms of the same race at the present day. Mr. Carruthers tells us that the leaves of grape vines found in the Egyptian tombs are identical with those of our time. We may also mention the Chinese, the same in the color of their skin, their language, tastes, and habits since they first appeared in

history. All this is easily accounted for. The animated beings have lived in scenes in which they have not been disturbed by their surroundings.

In other cases the plants and animals have undergone a series of changes. We may illustrate this by the history of the horse tribe. The earliest form is found in the Eocene rocks, where it treads the often soft ground with five toes, the typical number. Next it appears with three toes on the hind foot, and four perfect serviceable toes on the fore foot, with imperfect splint bones in the fore foot, and apparently a dew-claw on the hind foot. It is then about the size of a fox. Next comes the Orohippus, with the dew-claw dropped. Then we have in the lower Miocene the Mesohippus, in which the fourth toe has become a splint. Next the Miohippus, with the splint nearly gone, and the middle hoof larger. The animal is now about the size of a sheep. After this is the Protohippus in the upper Miocene and lower Pliocene, now about the size of an ass, with the middle toe larger and the two side hoofs shorter. The animal is becoming more and more like the modern horse. In the Pliocene we have the

Equus, almost a complete horse, with the hoofs reduced to one, the splints of the two sides remaining to attest the descent. Finally, in the human period, the Equus Caballus, our horse, perhaps the most elegant and useful to man of all animals, with the hoofs rounder and the second bone of the leg more rudimentary, and the splint bones shortened, still remaining. From the normal number of five, the toes have been successively dropped according to a regular law—first, the thumb, No. 1; then the little finger, No. 5; then the index, No. 2; same time the ring-finger, No. 4; and the middle finger, No. 3, only remains.[1] This is an apposite example of the way in which, by a process, God has provided the horse with its hard hoof for man, who to make it harder adds a shoe. I hold that there are as clear proofs of design in the hoof as in the shoe upon it.

IX.

CAUSES OF VARIATION.—The main cause is the tendency of complex bodies to differentiate. See p. 8. But there are special agencies. (1) I may mention the one to which Darwin has given such prominence. It is that of "Natural Selection," not a very happy phrase, as it

[1] Le Conte's "Elementary Geology," page 509.

is apt to leave the impression that there is a choice on the part of nature, whereas it is all produced by the arrangements made by the Creator. This law is otherwise called the "Survival of the Fittest." This principle is undoubtedly operating in all organic nature, and has mighty influences, as, for instance, in the five loose toes becoming one solid hoof in the horse. A tree, say an oak, expands in an English nobleman's park, where it has a rich soil and room to breathe in, and is dwarfed or dies in a cold and stormy climate. The rose grows into greatest fulness and becomes the La France in a cultivated garden. The principle of the survival of the fittest is a beneficent provision, as it preserves the strong and the useful, while the weak is allowed to die out and leave room for something else to take its place in the exuberance of God's works. The religious man should not object to it, if at certain junctures it produces a newer and higher species of plant or animal to make up, it may be, for the disappearance of an old species, say, of a mammal instead of a reptile.

(2) There is the strength produced by the exercise, and the weakness or disappearance by the disuse, of an organ. It is for physiologists

to explain this. In some cases they can do so. The use of an organ draws more blood, "wherein is the life," to it. However we may account for it, it is a fact with which we are all familiar, that the use of an organ makes it more useful, and thus leads to the farther use of it. The fisherman's chest expands, and the ploughman's limbs become stronger, by the employment which they give them. Useless organs disappear when they become cumbersome, as the two first and the two last toes have done in the foot of a horse.

(3) There are the small increments and decrements of organisms produced by the action of the elements and internal movements. These may continue and become hereditary. Thus a member may be cut off, or an augmentation made to it. There may be at times an extraordinary birth, which to a limited extent modifies the model form. By such retardations and accelerations, as they have been called, cumulative changes are produced, which go down to future generations. This is an agency much dwelt on by Cope and Hyatt, and it is undoubtedly acting everywhere in nature, and helping to produce the great number of variations in individuals, and, perhaps,

even in species which we observe clustering round the generic type.

These modifications are produced very much by the environment of the organism, which is always liable to be influenced by the company which it keeps. But as all organisms are complex, that is, have various elements, there may be changes produced by the interaction of internal forces, as, for example, when the plant or animal grows, or when it decays. It is certain that by these influences, and it may be by others, known or unknown, varieties are produced; some think even new species. Religion has nothing to say against this, and observation has much to say in its favor.

X.

Homologies with Adaptations.—The two facts which show design are order and adaptation, general order and special adaptations. They are seen in human workmanship, where we have houses, machines, clocks, watches, formed on a plan, but the parts made to accomplish special ends. They are seen in Divine workmanship, where we have common forms, with adjustments to a purpose; what I have called Typical Forms and Special ends. The common causes produce the general order, be-

ing so collocated by Him who instituted them. As they act they produce changes which by the same Divine wisdom accomplish particular ends.

In all animate nature we have homologies—that is, common forms adapted to different purposes. Thus in plants we have the petals, stamens, and pistils of the flower, all after the leaf type, according to the discovery of Goethe. I have shown that the tree, its branches, and its branchlets, are after the same form—that is of a leaf, as determined by its ribs. The four typical limbs of vertebrate animals become fins in fishes, wings in birds, feet in mammals, and two of them hands in man. There are typical vertebræ running along the backbone, but differing in different parts of the column, and with special appendages, in wings, and arms, and other useful organs.

There are also homologies in invertebrate animals not so determinate and often difficult to detect, but very instructive in showing a plan in the formation of these lower creatures, and some of them pointing on to the vertebrate structure, and to man himself: as when the limbs of a lobster are variously developed and used as jaws, walking and running organs, as well as for moving the gills, and supplying them

with a stream of water. It has been found that all the vertebrates and all the invertebrates, except the Protozoa, agree together in their early development from an egg by germ-layers, from which the different organs of the adult animals are variously produced.

Of the two factors the former—that is, the general order—is the more prominent in the types of the older naturalists and of Cuvier, and the other, that of specialty, is seen in the modifications produced by the environment, according to Lamarck, St. Hilaire, and Darwin. The two are illustrated by the arrangement of plants by Linnæus, one of the great classifiers of nature, under a binomial division of genera and species, the former representing the common resemblance, and the latter the special difference.

Now, the doctrine of development gives us a glimpse of the way in which the organs have been formed and varied to accomplish an end necessary to the existence of the plant and animal. It shows us, too, how organs disappear at times, leaving only a rudimental form, as evidence, like tombstones, of their once having lived. They have shrunk because no longer used, being no longer of use. Thus we have

the mammæ, in male animals, the sightless eyes of fishes in the Adalberg and Kentucky caves, and the rudimentary teeth in the young of whales.

I venture to suggest that seeds are the homologues of the whole plant, and the germ of the whole animal, being concentrations of these ingredients, and the product varying according to the ingredients present. Von Baer has shown that there is a most remarkable parallelism between the embryology of the individual, and the past history of the race. Animals start in the womb as a single cell, and though there is no doubt a difference, the embryo of man cannot be distinguished from that of a worm. But as the human embryo grows it becomes like a fish, a reptile, a mammal, and finally takes the human form. It thus passes through the series of the ramified classification of animals given above, the kingdom, sub-kingdom, class, order, family, genus, and species. "On the hypothesis of evolution this parallelism has a meaning; indicates the primordial kinship of all organisms and that progressive differentiation of them which the hypothesis alleges. But on any other theory the parallelism is meaningless." [1]

[1] Conn's "Evolution of To-Day," p. 144.

XI.

ARE SPECIES UNCHANGEABLE?—It is acknowledged on all hands, by evolutionists as well as anti-evolutionists, that all plants and animals belong to a natural species. This distinction has a safe place in the economy of nature. It accomplishes most important ends. It keeps nature from running into inextricable confusion. It makes organic nature comprehensible and usable by human intelligence.

So deep is the distinction, that about two centuries ago naturalists laid it down as a maxim, that species are so fixed as to be immutable—as the law of gravitation is. There are people who ask us, with a look of absolute incredulity and scorn: Do you really believe and have the effrontery to maintain that by natural law the lily can be changed into a rose and a sheep into a goat? The fixity of species has become (it was not so in ancient times) a religious doctrine, and a sacred feeling has gathered around it which it is dangerous to disturb. It is certain that species are so fixed that they cannot readily be changed. It is certain that God has so arranged natural law that combinations have been formed that cannot be dissevered by any ordinary law. No one believes that by natural selection a deer

can be turned into a horse, or a cow into an elephant. It is allowed that species are not so fixed as to prevent varieties. These often differ very widely from the original stock and from one another. What a difference exists in the pigeons, in their forms and colors, while they have all sprung from the rock pigeon. What a diversity in the roses, which have all come from the common dog rose. The breeds of dogs vary in size, in shape, in gentleness or fierceness, but are believed to be descended from some wolf-like creature. There are said to be about twelve species of horse, all descended from the Eohippus, and he from an older ungulate who lived a hundred of millions of years ago.

It is often urged as an objection to the theory of evolution, that the varieties and breeds of domestic animals which have been produced by the agency of man, are apt when allowed to run wild to return to the original type. It is not difficult to explain the actual facts in accordance with evolution as it is explained in this treatise. In the progress of development animals assume a fixed structure which they naturally retain and cannot easily be changed. But when placed in new surroundings alterations may be produced. These will continue

as long as the environment continues the same; that is, as long as the animal is in a state of domestication. But when it is placed back in its old position, its old nature still remaining in it will bring it back to its old form. Darwin mentions the case of domestic rabbits which were carried to the Isle of Porto Santo, near Madeira, in 1618 or 1619, A.D., and became there very different from any domestic breed, as well as from the original species. They are much smaller than the European rabbits. "The upper fur is redder, with few or no black hairs; the throat and belly are generally pale gray or leaden color instead of pure white." "The males of the Porto Santo rabbits refuse to associate or breed with the domestic varieties." When these rabbits were brought back to the London Zoölogical Garden, they began to assume the appearance of the English wild rabbit; the edging of the ears and upper surface of the tail became blackish-gray, and the whole body much less red. "Thus, on returning them to their original European environment, the characters of the parent wild species, which had been dormant at Porto Santo, began to reassert themselves." [1]

[1] Darwin: "The Variation of Plants and Animals under Domestication," vol. i., pp. 141–144.

The whole tendency of nature is to prevent the mixture of species, which in most departments is impossible, which in some cases is unnatural and restrained by the sterility of the offspring, and can never occur except in rare and exceptional cases. All the while it is not so easy to determine wherein a species differs from its congeners, and as to certain breeds, whether they are varieties or different species. A species is not constituted by mere external agreement, for creatures very like each other may belong to very different species and genera. The only decisive point which can now be fixed on as separating species is the infertility of the offspring produced by crossing. The offspring of different species when they pair are supposed to be unfertile. But it is urged by our advanced naturalists that even this mark is failing the anti-evolutionists. It is affirmed that there are hybrids which breed and continue to breed. It is known that there are different domestic races which cross and yet continue fertile. It is alleged that natural races may do the same, and that in rare cases the fertility of hybrids seems slightly greater than that of the legitimate young.[1] It does

[1] Conn's "Evolution of To-Day," chap. I.

not appear that the crossing of different species of plants leads to sterility. It is a question for science to settle and not religion, which does not seem to me to have any special interest in the question, though it is gratified to find that there are such limits to the crossing of natural kinds as to prevent breeds from running into confusion.

It has often been demanded of evolutionists that they present before our eyes a case of one species being changed into another. Evolutionists argue that this is unreasonable, as such transformations can take place only by slow processes, which cannot be noticed by any observer. This answer has commonly been regarded as sufficient. But now it is said that an actual transformation has been observed. A Russian naturalist, Schmankewitsch, had noticed that a species of crustacea, Artemia Milhausenii, has been changed by the gradual freshening of a salt-water lake in which the creature lived. Acting on the principle involved, he added salt to the water till he changed the species into another (A. Salina), which again he transformed into a third. Freshening the water, it was turned into still another creature which had been ranked as a

distinct genus by naturalists.[1] Let this case be thoroughly sifted by scientific men, who will determine for us whether the new creatures produced are mere varieties or really new species and genera. I am sure meanwhile that religion is safe whatever be the decision come to.

I have never been able to see that religion, and in particular that Scripture in which our religion is embodied, is concerned with the question of the absolute immutability of species. Final Cause, which is a doctrine of natural religion, should be satisfied with species being so fixed as to secure the stability of nature. If new species appear in our world, they differ so slightly from the old, out of which they have been formed, that there are no violent or revolutionary changes involved. Nature is kept steadfast and theism is satisfied, even though in rare circumstances a new species should be produced to diversify nature and make it equal to the duty of peopling the earth, which is certainly one of the purposes of God by which he widens the sphere of happiness.

[1] Conn's "Evolution of To-day," p. 26.

CHAPTER II.

THE ORGANIC HISTORY.

I.

THE FORMATIVE PERIOD OF THE EARTH.—"No one can find out the work which God doeth from the beginning unto the end." Science does not know what was the beginning, nor whether there has been a beginning in God's doings; nor does it know the end, for there will be no end. But we know that our mundane system, especially our earth, has had a beginning, and we can so far trace its history. According to the well-known theory of Kant and Laplace, started by each independently of the other, there is a mass of matter with an impulse given to it rotating from west to east, and throwing off the earth as a fiery liquid, to move in the same direction. As the earth rotates it is formed into an oblate spheroid. As it cools it has a solid crust with thick, gaseous substances surrounding it, which, in the process of time, are condensed into water. As it then

presents itself, it is composed of seventy elements, less or more, and in it are mechanical, chemical, gravitating forces, probably also magnetic and electric—whatever these may be.[1] As they operate, divisions and combinations take place—what are called differentiations and concentrations. The atmosphere is separated from the land, and, as the oscillations of the crackling earth go on, portions of land rise above the waters. "Mountain chains," says Le Conte, "seem to be produced by the secular cooling, and, therefore, contraction of the earth, greater in the interior than the exterior, in consequence of which the face of the old earth is become wrinkled." As yet there is no sun; which, in fact, is being condensed out of the nebular mass, but light and heat are generated, ready to nourish the tiny plants which are ready to spring up on the rocks lying under the waters. In all this God is working, not by special interferences, but by the natural causes which develop into effects—in other words, by evolution. So far, there is no difference of opinion. All is by evolution.

[1] There is a central truth in Laplace's theory, but, to account for the whole phenomena, a place must be given to the powers referred to above.

II.

THE ARCHAIC OR EOZOIC AGE.—In the long formative period there was no life; indeed, there could have been none, owing to the intense heat. Life appears first in the Laurentian rocks which stretch through Canada, where they are 40,000 feet in depth, on into the United States, and are also found in Scotland, and bulk largely in Bohemia. These are not primary rocks, for they are formed of matter carried by rivers into the sea. In them are found the Eozoon, of so amorphous a character that it has been disputed whether it is an animal or a mere mineral. If there were animals, there must also have been plants, vitalizing minerals, to feed them. We know otherwise that there must have been life, from the graphite and limestone in the formation. Life has appeared. How? Certainly from the God who made the world. Was it by God's immediate fiat, or by evolution? The question is started; the discussion of it may be adjourned till we have the facts fully before us. Meanwhile it is certain that from this date we have evolution—every plant and every animal from an ancestry.

III.

THE SILURIAN, THE AGE OF INVERTEBRATES, SPECIALLY OF MOLLUSCS.—The formation lies

unconformably on the Laurentian, showing long deposits and numerous upheavals. It is found in the borders of Wales and in the State of New York, and in many other places. There is now an abundance of plants, mainly marine, chiefly algæ, or sea-weeds. Animals are also numerous, such as sponges, radiates, corals, forming reefs, medusæ, jelly-fishes. There are fossils of beautiful graptolites, of stemmed echinoderms and crinoids. There are cephalopods, the most highly organized and most powerful of the tribe ; they are represented in the present day by the nautilus, the squid, and cuttle-fishes. In this age articulated animals appear, specially soft fleshy worms, not preserved themselves, but two hundred species are made known by their tracks and borings, so important in producing soil. In the Lower Silurian there is no evidence of terrestrial or fresh-water life. In the Upper Silurian there are remains of terrestrial plants, such as club-mosses. I am pleased to observe that these are branched at definite angles, like the trees which come at a late date. In the trilobites, which now reach their maximum size, well constructed eyes are visible of the invertebrate type. It is said that before the Silurian age closes, may be found vertebrates of a low type.

IV.

THE DEVONIAN AGE, WHICH MAY BE CALLED THE FISH AGE.—Hitherto the plants have been chiefly marine. Now land plants are abundant; and we discover many that are still with us, ferns, lycopods, equisetæ, also advanced conifers, which may have covered some parts of the earth with forests. "In the Hamilton beds the evidences of verdure over the land are abundant. The remains show that there were trees, as well as smaller plants; that there were forests of moderate growth, and great jungles over wide-spread marshes."[1]

There are peat-bogs and submerged forests, anticipations of the coming Coal Measures. Insects enliven the forests, and have organs to issue sounds which probably imply ears to hear them. The fishes which first came are ganoids, and sharks, some of them three feet thick and from fifteen to eighteen feet long. The more elegant forms of teleosts, which now swim in our seas have not yet appeared. "The most fundamental law of evolution," says Le Conte, "where is differentiation," *i. e.*, a separating of generalized into several specialized forms, a separation of one

[1] Dana's "Geology," p. 268.

stem into several branches. The Devonian fishes are an admirable illustration of this law. The first introduced fishes were not typical fishes, but sauroids—*i. e.*, fishes, which combined with their distinctive fish characters others which allied them with reptiles. They were the representatives and progenitors of both classes. From this common stem diverge two branches, viz., typical fishes on the one hand, and reptiles on the other. "This is but one example of a very general law which may be formulated thus: The first introduced of any class or order were not typical representatives of that class or order, but connecting links with other classes or orders, the complete separation of two or more classes or orders being the result of subsequent evolution."[1]

V.

The Carboniferous or Great Plant and Coal Age.—The great classes and orders of plants scatter, and are more firmly organized than in any other age. Between 2,000 and 3,000 fossil plants have been found, and one fourth of them are of this formation. The lower forms of plant life continue, but rising above them are the ramified forms of conifers,

[1] "Geology," p. 332.

lepidodendrons, sigillariæ, and calamites. These sinking in a warm, moist, stifling climate, and in stagnant water, become hardened by heat and pressure into coal. It is the great coal-bearing era with its sandstones, shales, and lime-stones, and with metalliferous veins running through them. Without the plant deposits, and the power from the sun stored up in them, human factories and man's working capacity would have been greatly limited. There are Coal Measures with a thickness of 10,000 feet, indicating what a length of time this age must have lasted. The fishes become reptilian in character, and amphibia make their appearance. The Palæozoic now passes away, and a new era appears.

VI.

The Mesozoic Age, That of Reptiles.—It is divided into the Triassic, Jurassic, and Cretaceous. It is not necessary in this epitome to give a separate account of each of these. The plants are still making coal in the Jurassic period. Vegetation consists mainly of such plants as ferns, cycads, and conifers ; but higher forms uppear. In this latter age the highest forms of plants, dicotyledons, come forth. Fossils of the trees with which we are familiar

are found, such as oaks, willows, poplars, sassifras, dog-wood, maple, hickory, beach, walnut, sweet gum, laurel, fig, sequoia, tulip.

In this age reptiles reign in the sea, on the land, and in the air, some of them crawling, such as saurians and crocodiles; but some standing and moving on their hind legs, thereby anticipating birds and man himself; and some of them, such as the pterodactyls, flying, and warm-blooded like mammals. In the Jurassic the Atlantosaurus, discovered by Marsh, seems to have been nearly 100 feet in length and 30 in height. To show how the forms run into each other, Dana says: "As in birds the bones of pterodactyls are hollow, to fit them for flying; but unlike birds they have the skin, claws, and teeth of reptiles. Their habits were those of bats rather than birds."[1] Birds come forth fully developed in this age; some of them not capable of flight. Birds begin in long-tailed or reptilian species; six species have been found with teeth. Some of the reptiles have mammalian characters, especially in the teeth. In the later deposits are found mammals nearly all of them marsupials and insectivorous. The character of the age is summed up by

[1] Dana's "Geology," p. 446.

Dana: "It is the era of the first mammals, the first birds, the first of the common or osseous fishes, and the first palms and angiosperms."[1] The disturbance which in America closed the Mesozoic period, upheaved half the continent.

VII.

THE CENOZOIC AGE, THAT OF MAMMALS.—"The ages," says Geikie, "of lycopods, ferns, cycads, and yew-like conifers have passed away, and that of dicotyledons and angiosperms, of the hard-wood trees and evergreens, now succeeds; but not by sudden extinction and recreation, for, as we have seen, some of these trees had already begun to make their appearance even in Cretaceous times."[2] The early animals were chiefly herbivorous, such as the Phenacodus, Coryphodon, and Hyracotherium. The age of reptiles is past, and marsupials are very much confined to Australia. In the fossils, we discover the remains of such animals as eagles, owls, and woodpeckers; nearly all the genera and many of the species of plants and also of invertebrates are the same as at present. This age closes with the great Glacial epoch, in which a great portion of the earth was covered with ice and snow,

[1] "Geology," p. 403 [2] "Geology," p. 837.

believed to have been 7,000 feet thick in Norway, and the temperature intensely cold. We see traces of it in the striated rocks, in our mountains, and in boulders often carried to long distances. The great ice sheets of Switzerland and Norway are remnants of it. The cold led to the destruction of many species of plants and animals, and the migrations of others toward warmer regions. In this age placentals, such as monkeys, make their appearance.

VIII.

THE QUATERNARY AGE, THAT OF THE LARGEST MAMMALS.—Plants and animals have become what they now are. Plants identical with species living all over Europe retreat to the northern regions and are found in high altitudes. In South America animals take the form of sloths, armadillos and llamas. In various countries mammals take a gigantic size, such as the extinct elks, the mammoth and mastodon. This mammal age gives way to that of man—intelligent and responsible man.

IX.

INFERENCES.—The above is a brief and necessarily imperfect geological history. We perceive that :

1. There is what scientists call system, what platonists call an idea, what theologians call design or purpose, in the history of organic life. It is produced by God, but the question arises, whether without, or with, creature instrumentality, and the further question, whether the instrumentality, if there be such, can be discovered by human research.

2. There is a gradual rise; through millions of years, or rather ages, of vegetable and animal life. The question is, whether this can be produced by evolution, always under God. It will be generally admitted that the formation of the mere matter of the earth, its seas, mountains, and rivers, have been effected by natural causes. May it not be the same with the growth of the organic world, it being always understood that the causes are different?

3. It is admitted that the individual plant and animal are generated from a parent. May it not be the same with the vegetable races—the horse we ride on, from an older and diminutive horse, birds and marsupials from certain forms of reptiles? There is nothing atheistic in this supposition.

4. We have convincing evidence of the descent of races from older races. I have already

given the details as to the horse. We have many other cases, these increasing as new regions are explored. The very Eohippos seems to have been a descent from the ungulates.

"In the earliest Tertiary deposits of North America," says Prof. Scott to me, "we find a series of five-toed plantigrade animals from which all the hoofed animals have descended, the difference between the various groups having been continually augmented with the process of time. The genealogy of the tapir and rhinoceros has now been completely made out, running back to a common ancestor in the early Tertiary formations. Step by step changes in the character of the dentition, and of all parts of the skeleton have been accumulated, until they result in animals of a very different character. In the same manner the passage from pig-like animals to the ruminants has been demonstrated, and the recent discovery of a five-toed ruminant proves the origin of the ruminating animals from the primitive common ancestors of all hoofed animals including even the elephant.

"The history of the Camel and Llama tribes is well understood; beginning with very small

four-toed animals with complete series of teeth in both jaws; then passing to forms in which only the two median, the third and fourth, of the original series are preserved; then these two fuse into a single cannon bone, some of the teeth are lost, and the limbs lengthen, the animals become larger, till the modern form is reached. Rütimayer has proved the gradual derivation of the Ox tribe from antelope-like animals, these from deer-like forms, and these again from the primitive pig-like types. In the case of the carnivora, we have clear evidence of their descent from insectivorous animals; and it has lately been proved that all of the land carnivora have been derived from the primitive dog-like animals of the Eocene territory. Transitional types between these animals and the bear series on the one hand, and the cat and hyena series on the other, are now abundantly known. There are many groups, it need hardly be said, as to which our information is still very incomplete, but new discoveries are continually announced which widen the horizon for us. It seems hardly too much to say that before many years the genealogy and inter-relationships of all mammalian groups will be fairly understood."

5. We have numerous examples of transition cases. Professor Scott says: "The earliest known birds, Archæopteryx, from the Jurassic formation, are amazingly close to reptiles in structure. They possess teeth of reptilian types, without a beak, in the modern sense of the word; the structure of the hand was unlike that of any living bird, in that the fingers were all free (*i. e.*, not fused into one mass), and all had claws; the foot can hardly be distinguished from that of some reptiles; the tail was like that of a lizard, but with a pair of feathers attached to each joint. It is particularly worthy of note that these peculiarities, even the possession of teeth, are reproduced in the embryos of modern birds. On the other hand, certain of the extinct reptiles approach these birds very closely in all points of structure, so that almost the only mark of separation between the two groups, birds and reptiles, is the presence or absence of feathers. Thus palæontology and embryology agree perfectly in the derivation of birds from reptiles." "The two pairs of fins in fishes represent the two pairs of limbs of higher species; an air-bladder, the lungs; a loose-bone in a closed cavity, the ear."[1]

[1] Dana's "Geology," p. 594.

It is well known that aquatic animals have become suited to a terrestrial life. The air bladder of certain fishes, such as the mud fishes of Africa, came to possess a respiratory function, and developed as a lung. In the tadpole we see the gill, but it is superseded by the lung. The male animal has mammæ ; the unborn whale has rudimentary teeth ; in the pithon there are rudiments of limbs. The whales and porpoises are like fish, but science declares them to be mammals.

We discover cases in which the distinctions supposed to be deepest in the organic kingdoms are effaced. The main distinction in plants is between the monocotyledons, which have parallel veins, and the dicotyledons, which have curved veins ; yet we have the arum and smilax, which are monocotyledons, and yet have reticulated leaves. Often have I seen the sun-dew plant sucking in insects and feeding on them, which shows that the difference between plant and animal is capable of being bridged over.[1] But perhaps the most striking

[1] Often on the Grampians of Scotland have I watched the beautiful sun-dew plant drawing in insects and dissolving them. Had I published this when I first noticed it, I might have anticipated Darwin in his discovery of flesh-eating plants. I failed to do this and lost my chance of becoming famous ! ! !

case is that in which there are exceptions to the law, which was supposed to be fixed and unchangeable, that all mammals bring forth their young alive—that is, are viviparous. These curious animals, the Duck-bill and the spiny Ant-eater, are truly mammals, yet the eggs laid by them have been found within the last few years in Australia by Caldwell and Haacke, showing that they are oviparous. All this does not prove that there is no such thing as Natural Kinds, or that there are no fixed distinctions in nature, and that therefore nature is not settled ; it shows merely that there are variations which diversify the unity in our world, and have this further advantage, that they show us the way in which nature works to produce an infinite diversity in the midst of sameness.

6. A confirmation of the theory of the evolution of races is found in the circumstance that in islands far removed from continents, as, for instance, Bermuda, St. Helena, the Galapagos, and through the Malayan Archipelago, there are no mammals. Quadrupeds have been produced on continents, and are not capable of swimming into these separated places. In these same islands are no species of frogs,

toads, or newts, as their spawns are killed by salt water. There are no placental mammals in Australia, except perhaps rats, which was separated from Asia before placental mammals had been gendered. If new species are necessarily the immediate creation of God, one does not see how he should not have created these in islands as well as on continents.

The following summary has been drawn out by Prof. Cope: "The mammalia have been traced to the theromorphous reptiles through the monotremata. The birds, some of them, at least, appear to have been derived from the dinosaurian reptiles. The reptiles in the primary representative order, the theromorpha, have been probably derived from the rhachitomous batrachia. The batrachia have originated from the sub-class of fishes, the dipnoi, though not from any known form. I have shown that the true fishes, or teleostomi, have descended from an order of sharks, the ichthyotomi, which possess characters of the dipnoi also. The origin of the sharks remains entirely obscure, as does also that of the pisces as a whole. Dohrn believes the marsipobranchii to have acquired their present characters by a process of degeneration. The origin of the

vertebrata is as yet entirely unknown, Kowalevsky deriving them from the ascidians and Semper from the annelida." [1]

All this does not mathematically demonstrate that evolution is and must be universal. It is conceivable that in regions yet unexplored there may be cases in which vegetable and animal life may have been produced otherwise than by parentage. But it is equally true that we cannot prove that gravitation must be necessarily universal. There may be worlds or, it is supposable, spots in our world, where bodies are held together by a different law from that discovered by Newton. All that can be done by mere observation in either case is to show that there is such a law extensively prevailing, with no known exception. But at this point there comes in the more universal law, established by a wide and uncontradicted experience, that nature is uniform. We are entitled to argue that the law of gravitation, being so wide-spread, is a law of nature, and must be operating in places of the earth or planets of which we know nothing. On the same ground evolutionists infer that the development of living beings is so general

[1] Cope's "Origin of the Fittest," p. 317.

that it must be universal throughout the organic world. But while the law of genetic descent is universal, it does not therefore follow that there is no other power involved in the genesis of our earth and the direction of its history. Every one acknowledges that gravitation has universal sway in our mundane system, but there are powers of chemical affinity, of capillary attraction, of electric and magnetic motion, also operating, which act with, or stay, or control the law of gravity: thus, magnetism will hold up a piece of metal which would otherwise fall to the ground. At this point extreme evolutionists are to be met, by showing that there are other powers which have acted with it or have limited it. I am to show that while there are universal laws of descent there are other powers necessary to the origination and continuance of the world.

CHAPTER III.

POWERS MODIFYING EVOLUTION.

I.

OTHER AGENTS BESIDES EVOLUTION.—There are agents performing an essential part in the formation and continuation of our world which are not mentioned, except incidentally, by geologists. There are some things which cannot be brought into the physicist's laboratory, and which therefore he may not be required specially to discuss; but he should not in his narrowness disparage or ridicule those who insist on looking at them and finding out the part which they play. I will do no more than refer to the creation of matter, to show that it has not been overlooked. But it is of importance to bring into view and meditate on certain agents which have played a most important part in the formation of our world, but which cannot, so far as we see, be evolved from the material which we have been considering.

II.

LIGHT.—We do not know all the mystery of its action. It consists of vibrations in an ether. When and whence came that ether with its properties? There is no evidence that it has developed in the ordinary action of matter. It is certain that it performs a very important part in the economy of nature. It is necessary to the growth of plants and animals. Perhaps no one can tell whether it has come from an antecedent mundane matter, or whether, like matter itself and its forces, mechanical, chemical, gravitating, it may not be the immediate product of the creative power of God, who said, "Let there be light, and there was light."

III.

LIFE.—Geology shows an indefinitely long azoic period in the history of our world. Life appears first when plants appear. It is not, like extension and mechanical power, of the essence of matter. The great mass of matter has no life. No chemical, magnetic, or electric force can produce it. No scientific man can manufacture it in his laboratory. It is something superinduced upon ordinary matter upon the four elements, oxygen, hydrogen, nitrogen, and carbon, which it turns to its uses. It pos-

sesses very marked properties : it has a power of Assimilation, such as the Crystal, the highest form of dead matter, does not possess, it draws in the elements, and transforms them into its own living body ; it has a power of Growth, and may expand a germ into the swelling tree or the huge mastodon ; it has a power of Reproduction, gendering a seed which genders other life ; it is intended that there should be a series of creatures enjoying life, and so it has a power of Waste whereby it dies, but leaves behind it a new life.

IV.

Sensation.—This appears in the animal in the Eozoic, or at least in the Palæozoic ages. It is allowed that ordinary matter does not possess feeling. There is no proof that vegetable life has it, though in our poetical moments we fondly believe that there are leaves and flowers with a sensitive nature. We are now in a higher region than the corporeal ; we are beyond the physical ; we are in the psychical.

This sensation cannot be defined so as to make it comprehensible to any who have not felt it. It is known, its very nature is, to all who have experienced it, so that explanation is not needed by them, and no explanation can

make it clearer to them. The creatures that have sensation have also a power of locomotion. Henceforth much of the activity of the world arises from animals seeking pleasure and avoiding pain. I defy any one to show that this sensation so varied, often so strong, can be produced from any of the powers previously existing on the earth, nor even from Life—in the plants we have life, but no feeling.

V.

Instinct.—There may be animals which have sensation, but with no instinct. But instinct appears very early in the animal kingdom. We have now more than life, more than feeling—there is a low kind of thought. It takes most remarkable forms in insects, such as ants and bees, which perform deeds of which they cannot be supposed to know the full meaning. Animals lay up food in summer to provide nourishment for them in the winter, of which they cannot have any clear conception. The mother duck makes it appear as if she could not fly, to allure the dog to follow her, and thus allow the ducklings to escape. The curlew places its bare nest on a place from which there runs a hollow, and down this it runs when a boy approaches, and raises a cry

at some distance to allure the boy from her eggs or young. Instinct rises higher in more advanced animals, such as horses, elephants, and dogs. It is natural and original, and does not depend on experience, though to a small extent it can take advantage of experience. We have now anticipation of intelligence. There is now memory; animals remember the blow, and the person inflicting it. There is imagination; dogs, as Aristole says, hunt in their dreams. There seem to be low kinds of reasoning, or at least of the association of ideas, on which reasoning so much depends.

VI.

Intelligence.—This may not be altogether independent of instinct, of whose acts it sees the meaning and makes use of them; but it is something higher. It looks at the nature of things, at their forms, colors, properties; and can discover the causes of things. "We know in part." It can abstract, generalize, and reason, and rise to an imperfect idea of the infinite. It can look far back into the past, and far forward into the future. It can devise means to accomplish ends. It can entertain feelings of sympathy and kindness, and it grieves over the decease of companions.

VII.

MORALITY and the higher intelligence are closely connected, and may have come in together. By the latter, we discover what things are; by the former, what they ought to be. Morality, then, reveals something higher. It shows us the distinction between good and evil, and lays man under obligation to attend to the one and avoid the other. We have now reached the highest eminence which this world has yet attained: the age of moral and responsible man.

VIII.

HOW HAVE THESE AGENTS COME IN? BY WHAT CAUSE?—I maintain that no one of them could have been produced by the ordinary powers of nature.

It is a law of causation anticipated, as can be shown, from an old date that a cause—I am speaking only of physical causes—can give only what it possesses. Causation cannot create any thing new; it cannot give what it has not within itself. There is nothing in the effect which was not potentially in the cause; that is, in the agents which constitute the cause. There is no proof that any of the agents just named, say sensation, or intelli-

gence, were in the atoms, or in the mechanical or chemical powers. But there is a point of time at which they appear, when the first pain or pleasure is felt, and the first perception of things takes place. The powers once introduced continue ever afterwards to act. Their appearance, from whatever cause they spring, constitutes an epoch. Their action is not inconsistent with the great geological changes, but is coincident with them, and operates in producing them.

Whence came they? How come they—the vibrating ether constituting light? So far as life is concerned, it is still true—*omne vivum ab ovo.* Our highest scientific men, even those most prepossessed in favor of the doctrine, allow that there has been no case produced of spontaneous generation—that is, of life proceeding from any thing but antecedent life. Whence, then, the first life? If there be a difficulty in getting life by evolution from the lifeless, there is much more in getting some of the other agents, say sensation from mechanical force, or instinct from chemical combination, or intelligence from electricity, or morality from all combined—say the morality of Joseph, "How can I do this great wickedness

and sin against God?" When these agents are generated they develop like products; from life proceeds life, and intelligence generates intelligence. But no mundane power can produce them at first, and it is reasonable that we should refer their production to God, to whom all power belongs, even the power of evolution. As evolution by physical causes cannot do it, we infer that God does it by an immediate fiat, even as he created matter and the forces which act in matter. We certainly know no other power capable of doing it. This seems a legitimate conclusion. It calls in a power known otherwise to work, and to be competent to produce the effect. It makes God continue the work of creation, and if God's creation be a good work, why should he not continue it?—often it may be with seasons of cessation that the already created agents may fully develop themselves. He may be a continuous creator as he is a continuous preserver, thus widening and enlarging the sphere of his wisdom and of his love.

IX.

HAVE THEY COME BY CREATURE AGENCY?—There may be, indeed, another supposition. Instead of creating immediately these powers,

God may have evolved them out of other agencies. But if so, it is clear that these have been called in at an appropriate time to produce the life, and the feeling, and the moral discernment. In this case the change necessary to be made in our statement would be, to make the appearance of these high agencies an act of Providence instead of an act of Creation. It may be allowable to put the supposition for a moment that these agents have been produced by some creature, when it will be discovered that there is no advantage in it, for the supposed producing powers are unknown to us, and evidently must forever remain unknown. We believe that there must have been an act of creation out of nothing at the beginning; and the probable conclusion is that epochal creations have been continued, not interfering with the previous work, but in the way of multiplying and expanding it indefinitely.

X.

The New Powers are Superinduced upon the Old.—It should be observed of these powers, when they come they do not imply or require the extinction or disappearance of the previously existing powers—as stronger ani-

mals often lead to the suppression of weaker. On the contrary, the new capacities are thoroughly adapted to the old, act upon them and with them, strengthen them and widen their influence. Light is necessary to the health both of plants and animals. Life gives new powers to the mineral, makes it move and assume new positions, and take new and varied forms of utility and beauty in the form of trees and flowers, of insects and fishes, of birds and quadrupeds, of man and woman. Sensation in eating and drinking, in gregarious intercourse, and the pairing of sexes, is the grand motive to the activity of the animal creation in earth, and sea, and sky. Instinct is the peculiar preserver and propagator of living beings all over the globe. Intelligence makes man, always because God has so appointed, the ruler of this last era, and gives him "dominion over the fish of the sea, over the fowl of the air, and over the cattle and every creeping thing that creepeth on the earth." Morality binds intelligent men to God above and to men and animals below, by stronger bonds than evolution can by a common descent and a like nature.

XI.

THE OLD POWERS CONTINUE TO ACT WITH THE NEW.—The new act upon the old, while

the old act upon the new, and the action is always a joint action, with an abiding conservation and a constant advance. The new and the higher take the old and the lower into themselves. The plant is formed out of the mineral, which is made to take the nobler forms of bird and beast. The animal cannot turn the mineral into food; in order to do this it needs to feed on the vegetable. Intelligence turns all these agents into use, to accomplish beneficent purposes. Morality would direct them all to holy ends.

CHAPTER IV.

BENEFICENCE IN THE METHOD OF EVOLUTION.

I.

God in Evolution.—There is, or was, a wide-spread idea that the doctrine of development is adverse to religion. This has arisen mainly from the circumstance that it seems to remove God altogether, or at least to a greater distance from his works, and this has been increased by the circumstance that the theory has been turned to atheistic purposes. This impression is to be removed, first, by declaring emphatically that we are to look on evolution simply as the method by which God works. It is a forgotten circumstance that when Newton proclaimed the law of gravitation it was urged that he thereby took from God an important part of his works to hand it over to material mechanism, and the objection had to be removed in a quarto volume written by the celebrated mathematician, Maclaurin ; and this was the more easily done from the circumstance

that Newton was a man of profound religious convictions. The time has now come when people must judge of a supposed scientific theory, not from the faith or unbelief of the discoverer, but from the evidence in its behalf. They will find that whatever is true, is also good, and will in the end be favorable to religion.

A second erroneous impression needs to be effaced. Because God executes his purposes by agents, which it should be observed he has himself appointed, we are not therefore to argue that he does not continue to act, that he does not now act. He may have set agoing the evolution millions of years ago, but he did not then cease from his operation, and sit aloof and apart to see the machine moving. He is still in his works, which not only were created by him, but have no power without his indwelling. Though an event may have been ordained from all eternity, God is as much concerned in it as if he only ordained it now. God acts in his works now quite as much as he did in their original creation. The effects follow, the product is evolved, because he wills it, just as plants generate only when there is light shining on them; just as day continues

only because the sun shines. A birth or a death may be brought about by a caused evolution, but the mother may rest assured that God is in both, rejoicing with her, or pitying her.

I hold that time is a reality, so perceived by our minds and so perceived by the Divine Mind. The *eternal now* spoken of by some of the schoolmen and by the poet Cowley is a contradiction. But while time, past, present, and future, is a reality to Deity, it may stand in a very different relation to him from what it is to us. Time, past and future, may be contemplated as immediately by him as time present is by us, and his love be literally an everlasting love, comprehending all time, as his omniscience does all space.

II.

FINAL CAUSE.—I do not propose in these lectures to prove anew the existence of God. This has been done so satisfactorily by a succession of able men since the days of Socrates that it does not need to be repeated. My aim rather is to show that the doctrine of evolution does not undermine the argument from Final Cause, but rather strengthens it by furnishing new illustrations of the wisdom and goodness

of God.[1] The proof from design proceeds on the observation of things as adapted one to another to accomplish a good end, and is equally valid whether we suppose adjustment to have been made at once or produced by a process which has been going on for millions of years. There is proof of a designing mind in the eye as it is now presented to us, with its coats and humors, rods and cones, retina and nerves, all co-operating with each other and with the beams that fall upon them from suns millions of miles away. But there is further proof in the agents having been brought into relation by long processes all tending to the one end. I value a gift received from the hand of a father; but I appreciate it more when I learn that the father has been using many and varied means to earn it for me.

III.

Is the Method of Evolution a Good One? —I am not prepared to prove that evolution is the best way in which God could have proceeded, or that there are no other ways equally good in which he acts in other worlds. All that I profess to do is to show that the method

[1] We have two excellent works published in our day on this subject, Saisset's "Final Cause," and Flint's "Theism."

is not unworthy of God; that it is suited to man's nature; that it accomplishes some good ends. It is to this extent that I would "justify the ways of God to man."

After all, however, as we do not see the end, as we only see half-done work, we cannot perceive the full wisdom of this mode of procedure. The common soldier did not discover all the wisdom of the military plans of Alexander the Great, of Julius Cæsar, of Napoleon, or of Grant, but he saw enough to convince him that they were skilful generals. This is our position in regard to God's works: we discover enough of the arc to calculate the rest; and as we see so much wisdom in the little that we know, we argue that there is vastly more in the much that is beyond.

People will not readily be reconciled to evolution till they are convinced that it is promoting a beneficent end. We may advance some circumstances fitted to produce this conviction.

IV.

Evolution Produces a Successive Order in the Organic World.—The present is evolved from the past, and is developed into the future. There is thus one orderly constitution of things from the beginning unto the

end, making us feel how stable all things are as one generation succeeds another. We inquire into the past in the assurance that, to whatever point we go, we find the same laws operating as now. The present is the offspring of the past, and we can trace its progenitors so far back. It is the seed of the future, and we can anticipate what is to come, influence it for good, and hand down our works to future generations. We all feel the blessing of children having parents and of parents having children. Since the days of Newton, every one sees how gravitation binds in one all contemporaneous nature, sun to planet and planet to sun. We may now see how development binds in one compact nature the whole of successive nature, the past ages with the present and the present with the future.

V.

Development by Small Increments Secures the Continuity of Nature.—The continuity of things was fondly dwelt on by Leibnitz and the theists of the last century, who showed that objects formed connected series, in which all the parts shaded gracefully into each other; and that there is a gradation from the lowest up to the highest, from the

sea-weeds to the tree, from the monad up to the elephant, from the lowest intelligence up to angel and archangel, and to God himself. In this century science is seeking to determine in what this continuity consists, and what are the limits to it. When properly announced it is seen to be a beneficent arrangement, securing the world from violent convulsions, from breaks and separations. It is caused, always by a divine arrangement, by means of the development of one thing from another, with which it is thereby connected. There is thus a permanence in the agents' working, with a prescribed and restricted variety in their action. There is a constancy in nature, but it is a constant change with a constant abiding.

VI.

It Secures Order and Adaptation in Nature.—These are the two principles in nature which prove design; each separately proves the existence of intelligence; when the two are united, the evidence is more than doubled. Development under God secures that the two are combined, while each has its own place. The common seed or stalk produces family liknesses throughout nature, while the divergences provide that each has its individuality,

by which it may be recognized. Thus in trees there is a trunk to give stability to the frame; this strikes off into branches which give a form to the whole; each branch is formed after the model of the tree, and gives off branchlets which are of a like shape; and the whole is clothed with leaves which are made, by the length and angles of their mid-ribs, to take the same form as the tree and its branches. In the higher animals, there is a backbone which gives a unity to the entire skeleton, and to it are attached as appendages various members of the body, each serving its purpose, such as ribs, feet, toes.

Lamarck at times used language which reads as if he said that the wishes of an animal may produce an organ; as if the wish of the animal to swim produced fins, and the wish to fly produced wings. I am not sure that the French naturalist meant this. If he did, he was evidently misinterpreting nature. There is will in the production, but it is the will of Him who arranged all things, and who has so arranged them that organs grow as they are used. Petals open to the sun and profit by the light, and roots grow toward their nourishment. We see fishermen with broad shoulders

and strong arms, and ploughmen with stout limbs. We can conceive of no method of action by which combined plan and purpose can be so effectually secured as by evolution.

VII.

DEVELOPMENT SECURES PROGRESSION.—This is not necessary. There are numerous cases in nature of degeneration and the disappearance of races, because of their not being suited to their environment, when it is meant that they should cease to exist. But as these give way others take their place, according to the beneficial law of the survival of the fittest, and the weak races are driven out by the strong. Nature may tend first to differentiate and scatter; but then it integrates, mainly by evolution, which gathers up the parts and produces higher organisms.

Farmers have always believed in heredity, and take advantage of it to produce fine breeds of sheep and cattle, dogs and horses: of sheep bearing rich wool, or yielding good mutton; of cows giving a flow of milk or supplying well-fed beef; of dogs to hunt sheep or hunt game; of horses to run swiftly, or drag loaded wagons. By a higher arrangement of nature, or rather, the God of nature, the organic world is progressing: the earth is covered with a richer vegeta-

tion, and there are cereals where before were only heaths and mosses, and man himself is farther removed from the savage state. We have thus a promise that our earth may become a perfect abode for a perfected man.

VIII.

THE METHOD OF DEVELOPMENT IS SUITED TO MAN'S FACULTIES.—Man is so constituted that he has to gather knowledge by experience. But of what use would experience be, if the future did not resemble the past? It has been shown, again and again, that God's procedure by uniform law is the only one which enables man, with his present nature, to lay plans in the ordinary business of life likely to be successful. Were there no such regularity he could not be sure that the sun will rise to-morrow, that seed-time will be followed by harvest, or that food will nourish him. But the successive uniformity and consistency of nature are determined by the law of evolution, whereby the present comes out of the past and goes down into the future, with both of which it has connections. Without this, our faculties being as they are, man's wisest counsels would have no certainty; not so much as a probability of success, and he would cease to devise and act, and in the end, cease to live. The method is suited to man,

and man to the method; and this by the fore-ordained purpose of God, who has made both and adapted them to each other.

IX.

Difficulties of Theism.—Every one acknowledges that in looking on nature as the work of God we meet with perplexities. Questions may be started which we cannot answer. How are certain evils, disease and death, and inevitable sorrow consistent with the justice and love of God? I fully admit that there are results following from the laws of God, which it is not easy to reconcile with the omniscience and benevolence of Deity.

Sir William Hamilton has made the remark that no difficulty emerges in theology, which has not appeared previously in philosophy. A similar remark may be made as to evolution. No difficulty arises on the theory of development, which does not meet us on the theory of the immediate creation of every new individual and species. The works of nature are equally the works of God on the one supposition as on the other, and the mysteries bear against God in the one case as in the other. The difficulties are swallowed up by the overwhelming evidence which we have in behalf of the omniscience and benevolence of God.

CHAPTER V.

FINAL CAUSE IN EVOLUTION.

I.

FARTHER EVIDENCE OF PURPOSE.—It is very generally admitted by evolutionists, by none more fully than Professor Huxley, that the theory of Evolution does not undermine or interfere in any way with the ordinary doctrine of Final Cause. The adaptation of one object or agent to another and their coöperation to accomplish a good end, to give a life and plan to the plant and comfort to the animal, are fondly believed by the great body of mankind to be a proof of design and of a designing mind. The force of the argument is not lessened by the circumstance that the skilful structures have been inherited. If man could produce a machine which not only does its work, say a watch to keep time, but genders another machine of a like kind with itself, every one would be impressed with the ingenuity of the structure. So the very circumstance that a plant and ani-

mal can reproduce another plant and animal is an evidence of a more far-sighted design. Evolution does not lessen the force of the teleological argument. The question is started, May not the union and conspiracy of forces involved in Evolution furnish new proof, as it certainly supplies new illustrations, of purpose and ends?

As there are still so many unfilled-up gaps in the evolutionary process, I would speak on the subject cautiously and with reserve. At the present stage of investigation I would not employ an argument from Evolution as furnishing the primary proof of the existence of God. But surely those of us who believe in God on other grounds may trace in the development of Nature evidence of his wisdom and goodness. We see proofs of purpose and skill in Nature as it now presents itself to us, and we can connect this with the mode of production of the objects; and we find the two, the present condition and past history, shedding light on each other. It is pleasant to think that when a new series of facts has been discovered reaching over thousands of ages, they teach the same lessons as the old facts which pressed themselves on the attention of our forefathers.

We see that contemporaneous Nature fits in beautifully to successive Nature as it is unfolded in the ages. Evolution, like geology, was at first looked upon with suspicion by religious people. But geology has come to be a strengthener of faith as it displays new instances of design, and is confirmatory of Scripture as showing that creation has proceeded by epochs like the days of Genesis. We may now see that there is a wonderful plan not only in the present state of the vegetable and animal worlds, but in the method of their production by evolutionary causation. God acts everywhere in nature through means, and we may discover a fitness in the means. Evolution is thus in thorough harmony with all the other operations of Nature, showing the evidently designed adaptation of one thing to another in the past and in the present.

We see evidently in Nature certain subordinate ends planned and executed, always under the highest end, the manifestation of the wisdom and goodness of God to the contemplation of the intelligent creation. One of these is the preservation and advancement of species.

God, as it were, says to the plants and animals, "Be fruitful and multiply and replenish

the earth." The science of Evolution has shown that these ends are accomplished in the most effective manner by Natural Selection and the other evolutionary instruments, such as the surroundings of the living creature, the use and disuse of organs, and, in the case of animals, the exercise of intelligence. These all tend to the spread of order and ends. In particular, Natural Selection, with its consequent, "the survival of the fittest," is a most beneficent provision. All the new organs have a use, are produced because they have a use; they continue as long as they are useful, and they commonly disappear when they have no longer a purpose to serve. Evolutionists are speaking and writing constantly of the use and usefulness of organs. Even those who have no belief in an intelligent use are obliged to employ the language to express the fact, and this because the fact exists. I could quote multitudes of passages to this effect from our most determined evolutionists, including Darwin and Spencer. Dr. Wallace sums up: "The shape, the size, and the colors of the petals, even the specks and spots with which they are adorned, the position in which they stand, the movements of the stamens and pistils at vari-

ous times, especially at the period of and just after fertilization, have been proved to be strictly adaptive in so many cases that botanists now believe that all the external characters of flowers either are or have been of use to the species." Wallace delights to trace such use, and has illustrated very specially three useful agencies employed in the development of plants and animals.

II.

THE MEANS OF SCATTERING SEEDS AND FERTILIZING PLANTS.—Some of these have been noticed with wonder and admiration from ancient date. Seeds are carried by winds all around, sometimes to immense distances, perhaps hundreds of miles. They have been transported across seas, on rare occasions from one hemisphere to another. Often the seeds are downy, so that they are easily wafted through the air. We have all observed that some of them have curious hooks to attach them to objects, or they possess adhesive matter whereby to cling to positions where they can germinate.

But of late years attention has been called to a very curious means of propagating plants. Birds and insects, such as bees, wasps, and but-

terflies, dip into flowers and fruits for nectar, honey, and other kinds of food, and as they do so the pollen adheres to them and they bear it to other plants, which they fertilize. It is pleasant to see the insects flitting from flower to flower, sipping sweets for themselves; but our pleasure is increased when we find them at the same time carrying on unconsciously a work necessary for the preservation of the economy of Nature. Some plants are self-propagating and do not need the aid of these carriers; but others have no means of self-fertilizing, and are dependent for the continuance of the species on the creatures which feed upon them, and are busy, without their meaning or knowing it, in carrying the fertilizing power from plant to plant. Naturalists tell us that plants generally are benefited by cross fertilizing; it is in this way that new forms of beauty are produced, as we see in roses, in pansies, and innumerable plants in our gardens, in the fields, and on the mountains. This work is conducted largely by birds, butterflies, and flying insects, which thus make plants fulfil their offices and cover the earth, to give animals their food and show their beauty to man, if he will only appreciate it.

III.

MIMICRY A MEANS OF PRESERVING PLANTS AND ANIMALS.—This is a very curious subject. Naturalists have been led to take special notice of it of late years. Edible animals and plants liable to be attacked as prey take the form of inedible creatures which devouring birds and insects are careful to avoid. Wasps and bees, which can defend themselves by their stings, are often imitated by insects of other orders, which are thus saved from destruction. Certain harmless snakes mimic poisonous species, and are thus preserved. A butterfly has been known to take the form of a snake with a threatening aspect, and thus it frightens its foes. It is said that the Kallima butterfly of India, as it rests on a twig, can scarcely be distinguished from a colored leaf. The British cuckoo is a very defenceless bird, but in color and markings is much like a sparrow-hawk, and is, therefore, not likely to be attacked. Let us understand precisely what these provisions mean. They amount to this, that defenceless creatures are more apt to be preserved by their resembling others which, as known to be able to meet their assailants, are not apt to be assailed. It does look as if the species which have this

property of mimicking are more likely to be preserved in the struggle for existence and go down to future generations. The most remarkable cases are those which are protected by color, and instances will be given under the next head.

IV.

Color as a Means of Recognition and Protection.—Color in the animal kingdom is an influential means of recognition, perhaps more than even form. It is by its marking and its hues that animals readily recognize their kin of the same species, that the bird discovers its mate, that the female spies the male. Some birds will not pair with a bird of a different color, even though it be of its own species. There are special "markings, bands, spots or patches of white or of bright color which vary in every species—and are often concealed when the creature is at rest, but displayed when in motion—as in the case of the bands and spots so frequent on the wings and tails of birds. Now these specific markings are believed, with good reason, to serve the purpose of enabling each species to be quickly recognized, even at a distance, by its fellows, especially the parents by their young, and the

two sexes by each other ; and this recognition must often be an important factor in securing the safety of individuals, and therefore the well-being and continuance of the species." Wallace adds : " The most common of all the characters by which species are distinguished from each other, their colors and markings can be shown to be adaptive or utilitarian." He is inclined to think that easy recognition " has had a more widespread influence in determining the diversities of animal coloration than any other cause whatever."

Color is a means of protection. Some colors are attractive and draw attention to the plant or animal, others are a warning or a signal flag against attack. Birds, butterflies, and insects are apt to take the color of the ground or food on which they live. Birds in the arctic regions are commonly white, so that they are concealed in the snow. The raven in the same region retains its black color because it is " a powerful bird and fears no enemy, while being a carrion feeder it has no need for concealment in order to approach its prey." In the rich vegetation of the tropics many birds, such as parrots and paroquets, are apt to take a green color, and so are not dis-

tinguishable. But as they need to be discerned by their mates, birds in tropical forests have usually small but brilliant patches of color. The pale color of birds prevalent in sandy and arid districts is in harmony with the general tints of the surface. In the case of many birds the eggs are so like the surroundings that it is difficult to distinguish them at any distance. In decaying vegetation the eggs are apt to be spotted, but not brilliantly. Those who hunt tigers and panthers tell us that it is often difficult to see them at any distance in the midst of the grass and under the trees. Wallace says the earliest leaf-eating insects acquired a green color as one of the necessaries of their existence. Those feeding on particular species would speedily acquire the peculiar tints and markings best adapted to conceal them upon these plants. We have all noticed how insects are apt to take the colors of the plants on which they feed. "It seems not improbable that fully one-half of the species in the animal kingdom possess colors which have been more or less adapted to secure for them concealment or protection."

It is of vast importance, in order to preserve the species, that birds should be protected

while hatching. From our childhood we have been interested to observe how this has been effected by their nests, often curiously constructed, being concealed in thick foliage or in holes. But there is another very powerful provision to secure the same end: while the male has often a showy coloring to attract the female, the female has often a tamer color to keep her unobserved. There are cases in which the male has the plainer coloring, but in these he sits on the eggs and the female fights the battles.

We could mention vast numbers of different kinds of color-concealment, but it will suffice to specify only a few. There are birds which lay their white eggs in open nests.

"All the duck tribe, the grebes, and the pheasants belong to this class; but these birds all have the habit of covering their eggs with dead leaves or other material whenever they leave the nests, so as effectually to conceal them. Other birds, as the short-eared owl, the goat-sucker, the partridge, and some of the Australian ground pigeons, lay their white or pale eggs on the bare soil, but in these cases the birds themselves are protectively colored, so that when sitting they are almost invisible,

and they have the habit of sitting close and almost continually, thus concealing their eggs. Pigeons and doves offer a very curious case of the protection of exposed eggs. They usually build very slight and loose nests of sticks and twigs, so open that light can be seen through them from below, while they are generally well concealed by foliage from above. Their eggs are white and shining; yet it is a difficult matter to discover from beneath whether there are eggs in the nest or not, while they are well hidden by the thick foliage above."

Briefly: "The white of arctic animals, the yellowish tint of the desert forms, the dusky hues of crepuscular and nocturnal species, the transparent or bluish tints of oceanic creatures, represent a vast host in themselves; but we have an equally numerous body whose tints are adapted to tropical foliage, to the bark of trees, or to the soil, or to the dead leaves, on or among which they habitually live. Then we have innumerable special adaptations to the tints and forms of leaves or twigs or flowers; to bark or moss, to rock or pebble, by which such vast numbers of the insect tribes obtain protection; and we have seen that these various forms of coloration are equally prevalent

in the waters of the seas and the oceans, and are thus co-extensive with the domains of life upon the earth."

Mr. Darwin first stated that flowers had been rendered conspicuous in order to attract insects which carry the seeds to fertilize plants. If insects had not been developed on the earth our plants would not have been decked with beautiful flowers, but would have produced only such poor flowers as we see in our fir, oak, and ash trees, on grasses, docks, and nettles, which are all fertilized by the agency of the wind.

V.

PROFESSOR DRUMMOND'S TROPICAL AFRICA. —In this work we have very interesting illustrations of the ends accomplished by the adaptations of color and forms. In some cases these serve the purposes of protection, in others of warning. Birds, monkeys, lizards, and spiders are very fond of butterflies. But there are two great families of butterflies, the *Danaides* and *Acraiedæ*, which are inedible owing to the presence in their bodies of acrid and unwholesome juices, and so they are saved from attack. They are distinguished by loud patterns and brilliant colorings, and float with-

out danger the forests with the utmost coolness in the broadest daylight with leisureliness, defiance, and self-complacency, while their duskier brethren have to hurry through the glades in terror of their lives. For the same reason, well-armed or stinging insects are always conspicuously ornamented with warning colors. "The expense of eating a wasp, for instance, is too great to lead to a second investment in the same insect, and wasps, therefore, have been rendered as showy as possible, so that they may be at once seen and carefully avoided. The same law applies to bees, dragon-flies, and other gaudy forms; and it may be taken as a rule that all gayly-colored insects belong to one or other of these two classes; that is, they are either bad eating or bad stingers. Now the remarkable fact is that all these brilliant and unwholesome creatures are closely imitated in outward apparel by other creatures not themselves protected by acrid juices, but which thus share the same immunity."

The puff adder is from three to five feet long and very thick, is ornamented with strange devices in green, yellow, and black. Its true habitat is among fallen leaves in the deep shade of the trees by the banks of the streams.

Now in such a position at the distance of a foot or two its appearance so exactly resembles the forest bed as to be almost indistinguishable from it. The harmony of color with environment is often very striking, even among large animals. "When we look, for instance, at the coat of a zebra with thunder-and-lightning pattern of black and white stripes, we should think such a conspicuous object designed to court rather than to elude attention. But the effect in nature is just the opposite. The black and white somehow take away the sense of a solid body altogether. The two colors seem to blend into the most inconspicuous gray, and at close quarters the effect is of bars of light seen through the branches of shrubs." The spotted pelt probably conveys the same sense of indistinctness, as in the case of the zebra. "The crocodile is marvellously concealed by its knotted and mud-covered hide, and it is often quite impossible to tell at a distance whether the objects lying along the river banks are alligators or fallen logs."

The most remarkable cases are those which have both form and color employed as mimicry. The mantis and locust tribes are found in all forms, sizes, and colors mimicking foliage at

every stage of growth, maturity, and decay. "Some have the leaf stamped on their broadened wing-cases in vivid green, with veins and midrib complete, and with curious expansions over the thorax and along all the limbs to imitate smaller leaves. I have again and again matched these forms in the forest, not only with the living leaf, but with crumpled, discolored, and shrivelled specimens; and the imitations of the crumpled autumn leaf are even more numerous and impressive than those of the living form. Lichens, mosses, and fungi are also taken as models by insects, and there is probably nothing in the vegetal kingdom, no knot, wart, nut, mould, scale, bract, thorn, or bark, which has not its living counterpart in some animal form. Most of the moths, beetles, weevils, and especially the larval forms, are more or less protected mimetically; and, in fact, almost the entire population of the tropics is guilty of personation in ways known or unknown. The lichen-mimicking insects even go the length of imitating holes, by means of mirror-like pools of black, irregularly disposed on the backs, or interrupting the otherwise dangerous symmetry of the fringed sides."

There are insects which imitate twigs, sticks, and the smaller branches of shrubs. There is the walking twig, three or four inches long, covered with bark apparently and spotted all over with mould like the genuine branch. "On finding one of these insects I have often cut a small branch from an adjoining tree, and laid the two side by side for comparison, and when both are partly concealed by the hands, so as to show only the part of the insect's body which is free from limbs, it is impossible to tell the one from the other. The very joints of the legs in these forms are knobbed to represent nodes, and the characteristic attitudes of the insects are such as to sustain the deception."

One of the most striking illustrations is exhibited by the grass-stalk insects which live in long grass all over the forest. "When you catch him his limbs are twisted about at every angle, as if the whole were made of one long stalk of the most delicate grass hinged in a dozen places, and then gently crushed up into a dishevelled heap. Having once assumed a position by a wonderful instinct, he never moves or varies one of his many angles by half a degree." "To com-

plete the deception, some have the antennae developed to represent blades of grass, which are often from one to two inches in length, and stick out from the end of the body, one on either side, like blades of grass at the end of a stalk. The favorite attitude of these insects is to grasp a grass-stalk, as if they were climbing a pole; then the body is compressed against the stem, and held in position by the two fore-limbs which are extended in front, so as to form one long line with the body, and so mixed up with the stalk, as to be practically part of it. The four legs stand out anyhow in rigid spikes like forks from the grass, while the antennæ are erected at the top, like blades coming off from a node, which the button-like head so well resembles. When one of these insects springs to a new stalk, it will at once all but vanish before our eyes. It remains there perfectly rigid a component part of the grass itself, its long legs crooked and branched exactly like dried hay, the same in color, the same in fitness, and quite defying detection." During three-fourths of the year the grass is dried by the sun into a straw-yellow color, and all the insects are painted to match. Although yellow is the ground

tone of these grasses, they are variegated, and especially towards the latter half the year, in two ways. They are either tinged here and there with red and brown like the autumn colors, or they are streaked and spotted with black or other markings painted by the finger of decay. All these appearances are closely imitated by insects. The blades alike with limbs, and are variously colored according to season and habitat.

VI.

EFFICIENT WITH FINAL CAUSE.—These run through the whole of nature. They have been known to have been different since the days of Aristotle, who distinguished them, and yet they are connected. When we use a magnet we are employing efficient cause. When we join other things with it to form a compass we have final cause, an end to serve by agents. We have seen that there are adaptations implying a purpose, but there must also be agents producing them. Whether we are able to discover them or not, there must be powers causing the adaptive colors and forms which we discover in nature. Wallace does not always distinguish between the two kinds of causes. In his explanations Wallace often writes as if

he had found an efficient, when he has only observed a final cause. Following physicists generally, he regards color as altogether subjective. In this I think he is mistaken. Color, like heat, which is a mode of motion, is an external cause of an organic affection. As such it has an objective existence. I do not say what precise sort of existence. I believe it exists, as a power or powers. According to the doctrine of Newton, when the white beam strikes on a plant it is divided into two parts, one part is reflected by the color of the surface, and the other is absorbed. While taken into the plant it is not lost—according to the doctrine of the conservation of energy no force is ever lost. It may abide for a time in the plant, till it is changed into some other form. Being in the plant, it is apt to come out in a complementary color, that is, in colors which together make up the white beam. Such colors are said to be in harmony, and when under the eyes at the same time are felt to be agreeable to man, and probably also to some or many of the lower animals.

We discover these complementary colors appearing together in nature. Thus we have green harmonizing with red and russet. The

soft hue which the author of nature has given to the leaf of tree and herbage is by far the most abundant color in the vegetable kingdom. Now, wherever the flower of a plant is red it associates agreeably with the leaf. The flowers of the rose and of many pinks, geraniums, mallows, lychnises, and innumerable others contrast strikingly with the foliage of the plants on which they grow. The eye delights to see the fruit of the cherry, the rose, and the thorn, and the berry of the holly, the yew, the common barberry, the mountain ash, and many others peeping forth from the green leaves. It often happens that according to the green so is the hue of the associated red. Again there is purple harmonizing with yellow and citrine. Purple of various tints, shades, and hues, such as red purple where there is a preponderance of red, and blue-purple where there is a predominance of blue, is the most frequent color of the petals of plants, and in beautiful contrast we often find yellow in the centre of the flower. Thus in the garden polyanthus, and in many varieties of auricula, the outer rim of the corolla is purple and an inner circle is yellow. More frequently the complement is found in the yellow anthers or yellow

pollen. It is certainly a noteworthy circumstance that as the frequent color of petals is purple so the most common color of the pollen of plants is yellow. In the flower of the forget-me-not which ever greets the eye so cheerily there is a border of blue purple and a centre or throat of orange yellow. In the pansy so rich and soft we have yellow of various hues and degrees of intensity brightened by a mixture of white. Eyebright has a purple and white corolla with a sprinkling of yellow on its odd lobe.

These harmonies prevail in other departments. In the evening sky the beam is divided into two, and we gaze on the blue or blue purple cloud contrasted with varied hues of red orange. Shells are commonly yellow, with purple spots decorating them. In birds we have commonly a sort of tawny hue, being a yellow with more or less of red, and a dark blue, or rather a dark blue purple. This collocation of colors is very frequent among our domestic fowls (the cock struts so magnificently amidst an immense profusion of purple and gold) and among raptorial birds, as for example, many falcons and owls, and is found among wading birds and many species of

thrushes. In more ornamented birds we discover red associated with green as in a number of todies and a great many parrots.

These harmonies make the objects of nature interesting and attractive to man, possibly also to animals. Acting with them is the beneficent principle of natural selection, which serves specially to furnish recognition, warning, and protection. But there are always agencies at work which produce these effects. Wallace shows that colors are most apt to come out on the parts of the plant and animal in which there is the most active vitality—the vitality commonly chemical action, drawing the color absorbed in the plant towards the part. "Color has arisen over surfaces where muscular and nervous development is considerable." The crown of the head, the throat, the ear-coverts, the eyes; the plumes have usually distinct tints in high-colored birds.

We have seen that animals are apt to take the color of the ground on which they lie. Of course they feed on that ground, and the color may be produced by the food on which they live, and by the survival of the fittest. There must also be a cause of the form of mimicry which they take; this may be found in part in

the tendencies of the animal and plant to take the same forms, as for instance, both to produce joints.

In this chapter I have simply opened up a new and interesting field. Others will enter in and possess it. It must evidently be the main topic of discussion in the Theology of Nature in the age to which we have come.

CHAPTER VI.

GEOLOGY AND SCRIPTURE.

I.

HARMONY OF GENESIS AND GEOLOGY.—It is not necessary to dwell on this subject. The correspondence has been demonstrated of late years by very competent men whose writings are accessible to all. In particular this has been done by the three men on this continent who have the best right to speak on this subject from their knowledge of physical geography and geology,—Dr. Guyot, Dr. Dana, and Sir William Dawson. I have been most indebted to the late Dr. Guyot's little book on "Creation."

In the one of these, the written record, we have an account of the genesis of the earth as it would have been witnessed by a spectator who had lived through the unremembered ages; in the other the combined results of the researches of geologists within the last few ages. The one is ocular; the other scientific.

This accounts at once for their essential sameness and their superficial differences—which do not imply any contradiction. Professor Huxley showed in a lecture in New York that there were contradictions between geology and Milton's picture of creation in "Paradise Lost," but he made no special reference to the Bible account—we may believe out of reverence—and he did not attempt to prove that geology contradicted Genesis.[1]

I believe that if you would ask a geologist to write for us a true account of the production of our earth in as brief a space as the first chapter of our Bible, he would confess his inability to do so. Suppose that the opening chapter of Genesis, all unknown before, were discovered and published in our day, it would at once be denounced as a forgery, constructed by one who knows geological science, and who varies the record simply to keep the trick from being detected.

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[1] Elsewhere in his reply to Gladstone he alleges that the Bible errs in placing birds earlier than reptiles. This he does by making (Gen. i., 24) "creeping thing" mean reptile, whereas I understand by it the lower mammals. Reptiles being mostly amphibious, are included in *taninnim* (Gen. i., 21), the moving or winged creatures placed before birds. In these ages there were numbers of flying creatures, including not only reptiles but amphibians.

II.

THE CORRESPONDENCE.—It consists first in both arranging the history into progressive periods in the one called Days, in the other Ages, Epochs, Formations; secondly, in the order of the appearance of living beings; and thirdly, in man being the consummation of the whole.

It may be useful to preface the comparison with a statement by Dana as to the geological epochs. "First, the reality of an age in history is marked by the development of some new idea in the system of progress; secondly, the beginning of the characteristics of an age may be looked for in the midst of a preceding age, and the marks of the future coming out to view are prophetic of the future" ("Geol.," p. 137).

It is scarcely necessary to show, after it has been so often done, that the word "Day" is constantly used in Scripture to designate a fixed period of any kind and is not confined to a period of 24 hours. Indeed, it is applied in Chapter i. of Genesis to the first three days, when, as yet, the sun was not formed and there could not have been days as we now measure them. In Genesis ii., 4, Moses writes "in the

day," (the meaning being a period—a very lengthened one,) "that the Lord God made the earth and the heavens." So it goes on in nearly every book of Scripture. It has been counted that there are upwards of a hundred places in which the phrase denotes a period other than that of the rotation of the earth.

We may now compare and contrast the two accounts the record by the spectator, and that by the savant. I keep to the general correspondence, which is sufficient for my purpose, and do not specify minute points about which there may be differences of interpretation.

It should be observed that in both there is an antecedent and unknown period, when, according to Genesis, the earth was without form and void; when there was a deep with darkness upon it, and when, according to geology, the mundane matter was shapeless and without life. The days or epochs begin with the creative acts.

GENESIS.	GEOLOGY.
FIRST DAY.	
The Spirit, the source of power and order, moves on the deep, and there is light.	There is no formed sun, but there is light ready to germinate the life now to appear.
SECOND DAY.	
The separation of the now sol-	The consolidation of the earth

idified earth from the expanse of heaven above.	from its previous igneous state, and the separation of the earth from its gaseous environment.
THIRD DAY.	
The dry land appears above the waters which previously covered it, and thus early plant-life appears.	There is vegetable life of a simple form anticipated in the Eozoic period, and coming forth more fully in the Silurian period.
FOURTH DAY.[1]	
The sun, moon, and stars become visible, and henceforth rule the seasons.	In this era the sun is formed into a definite shape, the moon is thrown off from the earth, and the stars become visible, owing to the atmosphere being cleared.
FIFTH DAY.	
Creation of the lower animals in water and in air. "And God said, let the waters teem with creeping things, swarm with swarmers, and fowl that may fly above the earth. And God created the great stretched out sea monsters (tanninim), and all living creatures that creep, which the waters breed abundantly after their kind, and every winged bird after its kind."	There are the lower forms of animals, chiefly marine, fishes, reptiles, rising to fowls. The latter part of the Palæozoic and the Mesozoic ages.

[1] I remember that when I was a boy an old infidel addressed me: "Oh, how can you believe the Bible, which says there was light before the sun appeared?" I was not able to answer the objection, but science now can do so when it tells us that the formed earth is older than the formed sun, and that there must have been light nourishing plants before the sun was condensed. In the present advanced stage of science, the infidel would have started an objection which cannot be answered if Genesis had made the sun appear on the first day.

SIXTH DAY.

Higher animals appear, carnivorous, herbivorous, smaller mammalia, such as rats, mice, and emphatically man, who has dominion over all animals. He is made in the image of God.	It is the age of mammals including marsupials. It culminates in man, who is in all points a mammal, but has intelligence, reason, and moral perception, as testified by psychology—a branch of science as certain as geology.

III.

HOW IS THE CORRESPONDENCE TO BE ACCOUNTED FOR?—The question arises and demands an answer, How comes it that there is such a correspondence between Genesis and Science, which has been formed in so much a later age? According to the common reckoning, which can be justified, the Pentateuch was written by Moses 1400 years before the Christian era. The wildest German neologists are sure it could not have been written later than the time of Ezra, 500 years before Christ. Every one ackowledges that the Pentateuch was translated into Greek between 300 and 200 years B. C., and that after this copies of it were to be found in many libraries. How, then, were the early Scriptures able to publish truths which have only been discovered by science in this century; truths many and varied and minute, and covering a lengthened series of years, amounting to at least a hundred millions?

There is only one answer to which reason will listen for an instant—the truths must have been disclosed to Moses as they profess by the immediate inspiration of God.

Those who do not believe in the inspiration of the ancient record have great difficulty in answering the question. Thus Dr. Romanes admits that "the order in which the flora and fauna are said by the Mosaic account to have appeared upon the earth corresponds with that which the theory of evolution requires and the evidence of geology proves."[1] He is able in explanation only to say, that "the grand old legend may contain in its beautiful allegory more of traditional history than the present age is always inclined to suppose." Tradition of whom? Of brutes who leave no record behind them, except their bones to geologists? Of men who have not got the science to hand down? Haeckel seems to take pleasure in declaring: "Two great and fundamental ideas, common also to the non-miraculous, meet us in the Mosaic hypothesis of creation with surprising clearness and simplicity—the idea of separation or differentiation, and the idea of progressive development or perfecting. Al-

[1] *Nature*, August, 1881.

though Moses looks upon the results of the great laws of organic development which we shall later point out, as the necessary conclusions of the Doctrine of Descent, as the direct actions of a constructing creator, yet in this theory there lies hidden the ruling idea of a progressive development and differentiation of the originally simple matter. We can therefore bestow our just and sincere admiration of the Jewish law-giver's grand insight into nature."[1] But the statement of Moses does not consist of an "idea," or "a grand insight," but of a long and detailed series of events such as could only have been discovered by scientific observation, and such as could not have been discovered by observation at the time of Moses. Even an Aristotle, a Newton, or a Cuvier, could not have constructed, by natural science, a cosmology, such as is presented to us in Genesis, had they lived 1400 years before Christ. I am not sure that Moses had such a grand insight into nature as Haeckel gives him credit for, or even understood fully what he wrote, of which we are constrained to seek the producing power in an inspiration from on high.

[1] Haeckel's "History of Creation," vol. i., p. 38.

CHAPTER VII.

THE AGE OF MAN.

FIRST EPOCH, THAT OF STRUGGLE.

I.

THE COMING TIME.—In all the geological ages we find in any one age the anticipation of the following. This may also be the case with the age in which we now live, the Age of Man. We see everywhere preparations made for further progress : seeds sown which have not yet sprung up ; embryos not yet developed ; life which has not yet grown to maturity. In particular we find that in this Age of Man, man has not yet completed his work.

In an age there is often more than one Epoch ; thus, we have the Lower and Upper Silurian ; in the Mesozoic, the Triassic, Jurassic, and Cretaceous. So in this Human Age we find two very marked Epochs, that of labor and that of rest, that of battle and of victory. The evening and the morning constitute the seventh as they do the other days.

II.

MAN'S DESCENT.—We have to answer the question so often put: Did man come into the world by ordinary generation? Of course, from the lower animals? To this I answer that at first sight there is something special in the forthcoming of man, and this conviction is deepened the deeper we explore his nature, his intellectual, moral, and spiritual faculties, his reason, his conscience, his free-will, which raise him far above the brutes. Your one-eyed evolutionists see only one side, and not the whole solid truth. Man is undoubtedly an animal; this of the highest, the mammalian form, the mammal standing upright and looking to heaven. But he is higher than the animal, and is allied to God, who made him and made all things. He discerns between truth and error, between good and evil; he sees distant consequences, and can rise to spiritual communion with God.

This is the double account of man given in Scripture. In Genesis i., he is higher than the animals, and has dominion over them; he is made in the image of God. This of his soul. In Genesis ii., he is formed of "the dust of the ground." But there is a higher

power superinduced; God "breathed into his nostrils the breath of life, and he became a living soul." We have a most inadequate view of the nature of man unless we look at both these aspects. The anatomist, the materialist, does not see half the man. His microscope may show us the soft pulpy nerves and brain, but cannot exhibit to us the soul with its high imaginings, its lofty perceptions, its sense of moral obligation, its glimpses of the world to come.

Mr. Alfred B. Wallace, the co-discoverer with Darwin of universal evolution, argues that there is something special in man's appearance on the earth. It is not a development from what existed before; it is a creation of something new; a capacity of beholding, admiring, and following the good, the holy. But this new power is not altogether an anomaly, an exception. It is one of a series, the highest of the series. We have seen that rising above matter there is life, there is feeling, there is intelligence, there is moral discernment, and now there is love and law; there is love to expand and law to bind the universe. If any one ask me if I believe man's body to have come from a brute, I answer that I know not. I believe

in revelation, I believe in science, but neither has revealed this to me; and I restrain the weak curiosity which would tempt me to inquire into what cannot be known. Meanwhile I am sure, and I assert, that man's soul is of a higher origin and of a nobler type.

III.

THE WARFARE.—Scientific men have now hit on the fit phrase, "the struggle for existence," which so aptly characterizes our era. In books on natural theology, writen in the last century and the beginning of this, this world was pictured as a scene of order and beauty, of wisdom and benevolence. Now the picture has been darkened. It is seen and acknowledged that if there be good in our world, there is also evil. We have as clear and decided proof of the existence of the one as of the other. There is pain in our world, and this is certainly an evil; pain to which we are all liable, often keen and long continued, lasting for hours, and days, and years, without the possibility of alleviation, and the sufferer has to cry in the evening, when shall it be morning, and in the morning, when shall it be evening. There is the deeper evil, apparently the source of all other evils—that of sin, of in-

gratitude, lust, deceit, malignity. We feel it in ourselves, we take guilt to ourselves, being convicted by our own consciences. No explanation, no history of our world is at all adequate to explain the facts, unless it looks at both these aspects, the evil and the good. In the very midst of our world is the tree of knowledge of good and evil; as in the midst of the paradise restored is the tree of life.

The history of our world is given in epitome, Gen. iii., 15: "I will put enmity between thee and the woman, and between thy seed and her seed; it shall bruise thy head and thou shalt bruise his heel." The contest is between the good, represented by the seed of the woman,—not "seeds," as of many, but seed, as of one, the deliverer,—and the seed of the serpent; in which contest the seed of the woman, bitten in the heel, shall bruise the head of the serpent and crush the evil. This world is not a scene of pure good or of unmixed evil: it is one of contest between the evil and the good; between the seed of the serpent, the animal and the malignant power, and the seed of the woman, the pure and the loving power. We have an emblem of it in the Tree of Life, allowed for a time in the

garden of Eden, and the flaming sword burning every way to guard it. We have it exhibited in Cain slaying his brother Abel; "and wherefore slew he him? because his own works were evil and his brother's righteous." We see it in the two families which divided the antediluvian world, that of Cain and that of Seth. Many of the Psalms, which the Church continues to sing, as they are in accordance with the experience of our hearts, are war songs: "Gird thy sword upon thy thigh, O Most Mighty, and in thy majesty ride prosperously, because of truth and meekness and righteousness, and thy right hand shall teach thee terrible things." Psalms xlv., 3, 4. The burden of the prophets is deliverance from evil. "He shall see of the travail of his soul, and shall be satisfied." Throughout the discourses of our Lord there is reference to the good contending with the evil and overcoming it. The tares sown by the enemy grow with the wheat until the harvest, when the tares are burnt. The essence of the Gospel is to be found in the lost sheep brought back by the shepherd, in the lost money found, in the lost son in the embraces of his father. The warfare is not only without us, the deeper struggle

is within. "The flesh lusteth against the spirit and the spirit against the flesh, and they are contrary the one to the other." The whole warfare is described in Romans vii., 8–25. "I see a law of my members warring against a law of my mind." "O wretched man that I am! who shall deliver me from the body of this death?" "I thank God through Jesus Christ our Lord." The decisive battle was fought when Jesus suffered on the cross; the victory was won when he rose from the dead and ascended into heaven leading captivity captive.

SECOND EPOCH; THE SPIRITUAL.

IV.

THE REDEMPTION.—God is love; essentially love. He loves every living creature as if he were the only one whom he loved; he cares for the lilies of the field and the fowls of heaven, for the widows and the fatherless. I believe that in every one of the countless worlds, counted only by him who counts the number of the stars, there may be a sepa ate manifestation of the manifold wisdom of God. I am sure that each of the worlds has especial marks of his love. One of the highest is in that world in which we dwell, the

world which has fallen, the world that has sinned, but which he redeems and restores. I am not sure that there is a higher, that there can be a higher. "When the fulness of time was come God sent forth his Son, made of a woman, made under the law to redeem them that were under the law, that we might receive the adoption of sons" (Gal. iv., 4). Here in the world in which we dwell the Creator has become the creature to associate himself more intimately with creation. "The Logos was made flesh, and dwelt among us" (John i., 14). Though fully and altogether man, he does not become so by ordinary generation; he is born of a virgin. There is a fixed time, a fit time, in his coming, and in all the events of his life, which cannot be delayed nor hastened. There are sin and suffering in our world, and the Son of God became man that he might suffer in our room and stead, and sin is atoned for while it is condemned. This was planned and contemplated from the beginning. He is "the lamb slain from the foundation of the world." (Rev. xiii., 8). I was set up from everlasting, from the beginning, or ever the earth was." "He was rejoicing in his habitable earth [new version], and his delights were with

the sons of men." (Prov. viii., 23, 31). Who is this that cometh from afar, "with dyed garments?" "This that is glorious in his apparel, travelling in the greatness of his strength? I that speak in righteousness, mighty to save" (Is. lxiii., 1). "He was wounded for our transgressions; he was bruised for our iniquities." (Is. liii., 5). He has become perfect through suffering (Heb. ii., 10). To perfect his love he suffered, that the love of benevolence might also become the love of sympathy; he feels for us, for he has felt with us.

V.

Signs of Restoration.—There is certainly evil in our world, but there is also good. The scene is a checquered one of light and shadow. We live in a world where day and night alternate. Every man walks in light, but accompanied by his own shadow, the shadow being sin, which is the obstruction offered to the light. But the creature is striving against the tendency to evil. If there be diseases in our world, there are also remedies. If there be winters in the succession of seasons, there are also springs going on to summers and harvests. If there be the death of the individual, there is a continuance of the race. If there be deaths, there

are also resurrections. Nature is struggling, but it is in order to improvement. It is ploughing and sowing, but in order to reap in due season. It is moving onward, but also upward. It is groaning, but it is to be delivered from a load. It is travailing, but it is for a birth. It is not perfect, but it is going on toward perfection.

Looking to our earth, we find causes working which will certainly improve it. Education has reached a high state in certain countries, and will spread to all by missions and other agencies, thereby stimulating intelligence. Agriculture is advancing, and will destroy wild beasts, cultivate wastes, and spread fertility. Commerce is binding the nations closer together. Human life is being lengthened indefinitely. "The child shall die a hundred years old."

The Scriptures all along look forward to a better era. The seed of the woman is to bruise the serpent's head. In Abraham's seed all the nations of the earth are to be blessed. The Psalms commonly begin with praise, describe a fight, and close with a triumph. The prophets look forward to a light about to dawn, and their faces are brightened by it. "And it shall come to pass afterward, that I will pour out my spirit on all flesh" (Joel ii., 28).

VI.

THE DISPENSATION OF THE SPIRIT.—A new power is imparted, and begins to work. "The spirit of the Lord is upon me, because he hath anointed me to preach the gospel to the poor; He hath sent me to heal the broken-hearted, to preach deliverance to the captives, and recovering of sight to the blind, to set at liberty them that are bruised, to preach the acceptable year of the Lord" (Luke iv., 18, 19), the year of jubilee, the year of restoration.

The king establishes a kingdom. On leaving the earth, he leaves one to carry on the work. "I will send another Comforter, to abide with you forever, even the Spirit of Truth" (John xiv., 16, 17). "Thus spake he of the Spirit, which they that believe on him should receive" (John vii., 39). But while travailing on earth, he had to say The Holy Ghost was not yet given, because that Jesus was not yet glorified (John vii., 39). In a sense, the Holy Ghost was given before, and had fallen on one after another in the Old Testament times, perhaps also on such men as Socrates (who claimed to have been guided by a daimonion) in other lands. But this was an anticipation; as we have seen that in geological

times a higher life would appear in an earlier than its own proper age—the mammal in the age of reptiles. The new power descended when "the day of Pentecost," the feast of first fruits was "fully come" (Luke ii., 1). A new epoch has begun. For a time there is a struggle between the flesh and the spirit.

We have seen that when the new powers come in they act upon, and act with the old. The organic, as the higher, employs the inorganic powers, which, in spite of resistance, it turns to its own uses. Intelligence, instinctive and rational, directs and controls both, and morality would turn them all to a high end. It is thus, also, with the development now going on. It proceeds by two potencies, the natural and the spiritual. As I have said elsewhere: "There are the old powers still working, those of sense and understanding, of reason and conscience. These constitute the life which God breathed into man when he became a living soul. Their crowning part is the reason, speculative and moral, made after the likeness of God, and lying deep down in our nature, beneath the incrustations covering it from the sight, but capable of being wakened up. Upon these the new and spiritual powers work. Much that

takes place in the Church is the joint result of the two. The inspiration of Moses, of the prophets, and apostles, did not destroy their natural character; it merely sanctified and elevated them. The spirits of the prophets were subject to them. Religion does not eradicate the natural powers, it moulds them and directs them to higher ends. The man's faculties and temperament are not changed by his being converted; if he was lively and impulsive before, he is so still, if dull and solid, he will continue to be so; but the whole elevated by the spiritual power."

In all past ages there have been new powers added. Life seized on the mineral mass, and formed the plant; sensation imparted to the plant made the animal; instinct has preserved the life and elevated it; intelligence has turned the animal into man; morality has raised the intelligence to love and law. The work of the Spirit is not an anomaly. It is one of a series; the last and the highest. It is the grandest of all the powers. It is an inward power, convincing, converting, sanctifying, beautifying, and preparing the soul for a heavenly rest, where, however, "they rest not day nor night"; for rest consists in holy and blessed service.

The history of our earth is thus one, a connected and consistent whole—a system. It is a struggle and a victory. Our older divines used to argue that death came on the lower animals because of the sin of Adam. Geology has dissipated this fancy, which has no countenance in Scripture, and has shown us that death has reigned from the beginning of life "over them that had not sinned after the similitude of Adam's transgression, who is the figure of him that was to come," who has gone down into the grave, grappled with death, and conquered it.

Our lot has been cast in the time of war. "Woe is me that I dwell in Mesech"—the scene of strife. But all the while, thanks be to God, who hath called me to be a soldier with the whole armor of God at my command, and sure of victory. I am but a common soldier in the heart of the battle, and I see but a little way around me. But I see in front of me the captain of my salvation leading, and I follow him. Already in anticipation I hear the shout of victory. "Blessing and honor and glory and power be unto him that sitteth upon the throne and unto the lamb for ever and ever."

There has been a troubled day, but "at

evening time there is light." Every mystery is cleared up; every evil is removed; the last enemy is destroyed; death is swallowed up in victory; the conqueror has gone up on high. "Lift up your heads, O ye gates; even lift them up, ye everlasting doors, and the king of glory shall enter in." It is revealed that the saints shall live and reign with him "a thousand years" (Rev. xx.,4), the day standing for a year, and constituting a geological epoch.

VII.

THE CLOSE.—I have tried to unfold a panorama of our earth's history, from its commencement to its close, so far as I can see it by the light of science and of Scripture. It is a flickering light, with crossings and interferences of rays. At times I am dazzled with excess of light, and at times there is a dimness by reason of distance, and I can scarcely distinguish land from cloud. The several Ages rise like mountain ranges, one beyond the other, apt to be covered with clouds, but their outlines visible one beyond the other, with valleys between. The history is one throughout, the evening and the morning always making the day.

In the dim distance I see the scene of dark-

ness, with unending light beyond. After the thousand years are fulfilled, Satan—that is, the power of evil—must be loosed for a little while (Rev. xx., 3). It is a brief, it is the final, conquest. "There came down fire from heaven and destroyed them." It is a curious and most noteworthy circumstance, that according to recent science if the powers in nature continue to operate as they now do, the earth, after an indefinite time, must be burned with fire. It is another curious circumstance also to be noted, that an old fisherman living on the banks of the Sea of Galilee saw the same fact, (2 Pet. iii., 7). "The heavens and the earth are reserved unto fire." They pass away in their present form.

Our earth is now burned up. It has fulfilled its purpose. We may look back upon the scenes which it has presented: scenes for epics, for comedy, and for tragedy; of heroic deeds, and of cowardly deeds; of lofty purposes, and base purposes; of joys and sorrows; of bright prospects, and dark disappointments; of smiles and of tears running down the furrows made by them; of buoyant strength, and wasting disease; of blooming health, and of wounds and blood; of friendships and strifes; of peace

and war; of the plough calling forth the riches of the soil, and the sword drenching it with blood; of happy and peaceful families, of distracted families and desolate households; There is the mother rejoicing over her newborn babe, and Rachel weeping for her children, and refusing to be comforted; there is the lover's love, the wife's devotion, and the adulterer's lust, separating forever those who would once have died for each other; there is the patriot dying for his country, and the traitor betraying it to the enemy; there are the groans of the dying, mingling with the shouts of victory,—all these falling under our observation, narrated in history and biography, pictured in drama and in novels, and experienced here in our own hearts and lives.

This is the scene presented in the First Epoch; but this is not to be the Last Epoch. Were it so, we should feel it to be unworthy of God. But we have evidence that he all along purposed something better, and prepared for it. There has been a battle leading to victory and unending peace. There has been a winter with its storms, but the winter is over and gone, and is succeeded by eternal spring. There has been night lighted only by stars,

but the evening is followed by morning, and the evening and morning constitute the seventh day.

At the close the earth perishes. Having been the scene of so much sin, it is fit that it should be purified by fire. "The heavens shall pass away with a great noise, and the elements shall melt with fervent heat, and the earth also, and the works that are therein shall be burned up." The tares and the wheat have grown together until the harvest, but now the tares are burned up and the wheat is gathered into the garner. The evil is separated forever, and all that is good remains in the day when God maketh up his jewels.

I cherish the belief that each of God's innumerable worlds may have its own manifestation of the glory of God, each star differing from another in glory. "There is one glory of the sun and another glory of the moon and another glory of the stars." We know what the glory of our world is. It may not have been equalled, it cannot be surpassed, by the glory of any other. A derangement has occurred. "By one man sin entered into the world, and death by sin." But "when sin abounded grace did much more abound." Sin is condemned, and

yet the sinner is saved. The Logos becomes flesh and dwelt among us; the Creator and Creature are brought into closest relationship. But the end to be accomplished by the God-Man's kingdom is now accomplished. "When all things shall be subdued unto him, then shall the Son also himself be subject unto him that put all things under him, that God may be all in all" (I Cor. xv., 28). I can see no farther into the endless light that stretches out beyond. My hope is to be there and live there forever; then shall I know, even as also I am known.

THE END.

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