

J. H. Lafferty.

EVOLUTION.

BY

JAMES WOODROW.

COLUMBIA, S. C.

PRINTED AT THE PRESBYTERIAN PUBLISHING HOUSE.

1884.

EVOLUTION.

AN ADDRESS

DELIVERED MAY 7TH, 1884, BEFORE THE ALUMNI ASSOCIATION
OF THE COLUMBIA THEOLOGICAL SEMINARY,

BY

JAMES WOODROW,

PERKINS PROFESSOR OF NATURAL SCIENCE IN CONNEXION WITH
REVELATION, IN THE THEOLOGICAL SEMINARY
AT COLUMBIA, S. C.

COLUMBIA, S. C.

PRINTED AT THE PRESBYTERIAN PUBLISHING HOUSE.

1884.

EVOLUTION.

ADDRESS.

Gentlemen of the Alumni Association:

At the same time that you honored me with an invitation to deliver an address before you on this occasion, the Board of Directors of the Theological Seminary, in view of the fact that "Scepticism in the world is using alleged discoveries in science to impugn the word of God," requested me "to give fully my views, as taught in this institution, upon Evolution, as it respects the world, the lower animals, and man." Inasmuch as several members of the Board are also members of this Association, and both Board and Association feel the same interest in the Seminary, I have supposed that I could not select a subject more likely to meet with your approval than the one suggested to me by the Directors.

I am all the more inclined to make this choice, as it will afford me the opportunity of showing you that additional study has, in some respects, to a certain extent modified my views since I expressed them to many of you in the class-room.

As is intimated in the Board's request, I may assume that your chief interest in the topic is not in its scientific aspects, but in relations it may bear to the word of God; and therefore I will speak mainly of these relations. Not that I regard you as indifferent to science; from my past acquaintance with you, I have too high an appreciation of your intelligence to regard that as possible; for no intelligent person can be indifferent to knowledge, and especially can no intelligent child of God be indifferent to a knowledge of his Father's handiwork, or of the methods by which he controls the course of his universe. Still, on the present occasion it is doubtless the relations between science, or that which claims to be science, and the Bible, and not science itself, that should receive our attention.

Before entering on the discussion of the specific subject of Evolution in itself and in its relations to the Sacred Scriptures, it may be well to consider the relations subsisting between the teachings of the Scriptures and the teachings of natural science generally. We hear much of the harmony of science and Scripture, of their reconciliation, and the like. Now, is it antecedently probable that there is room for either agreement or disagreement? We do not speak of the harmony of mathematics and chemistry, or of zoology and astronomy, or the reconciliation of physics and metaphysics. Why? Because the subject-matter of each of these branches of knowledge is so different from the rest. It is true we may say that some assertion made by astronomy cannot be correct, because it contradicts some known truth of mathematics or of physics. But yet, in such a case, we would not proceed to look for harmony or reconciliation; we would confine ourselves to the task of removing the contradiction by seeking the error which caused it, and which it proved to exist; for we know that, as truth is one, two contradictories cannot both be true.

May it not be that we have here a representation of the probable relations between the Bible and science—that their contents are so entirely different that it is vain and misleading to be searching for harmonies; and that we should confine our efforts to the examination of real or seeming contradictions which may emerge, and rest satisfied, without attempting to go farther, when we have discovered that there is no contradiction, if it was only seeming, or have pointed out the error that caused it, if real?

Let us test this point by examining special cases which have arisen, and with regard to which conclusions satisfactory to all believers in the Bible have now been reached.

In Genesis i. 16, the Bible speaks of the two great lights, the sun and the moon, and of the stars as if these were of comparatively insignificant size and importance. It says further, Joshua x. 13, that “the sun stood still, and the moon stayed”; “the sun stood still in the midst of the heaven, and hasted not to go down about a whole day.” In these and other passages the Bible has been thought to teach that the sun and the moon are larger than any of the stars, and that sun, moon, and stars, having been

created for the benefit of man, revolve around the earth as a centre. On the scientific side, two forms of astronomy have been presented: the Ptolemaic, teaching that the earth is the centre of the universe; the Copernican, teaching that the sun is the centre of our planetary system. Those who asked for harmony between science and the Bible found wonderful confirmation of the Bible in the Ptolemaic astronomy, and of the Copernican astronomy in the Bible. But gradually it came to be seen and admitted that, whatever might be its teachings on other subjects, the Bible was at least not intended to teach astronomy; and for centuries general assent has been given to the words of Calvin: "Moses does not speak with philosophical acuteness on occult mysteries, but relates those things which are everywhere observed, even by the uncultivated." . . . "He who would learn astronomy, and other recondite arts, let him go elsewhere." Thus it has come to be believed that all we are entitled to ask, as regards the relations between astronomy and the Bible, is that they shall not contradict each other; not that they shall agree with each other. Believers in the Bible as such are indifferent as to what form of astronomy may prevail. Calvin's belief in the geocentric system no more interfered with his confidence in the Bible than does our belief in the heliocentric system interfere with our confidence in the same sure word.

Geography furnishes another illustration of this same kind of harmony between the Bible and science, which is not less instructive. For centuries geographers taught as science that which was claimed to be in perfect accord with the Bible in such passages as these: "They shall gather together his elect from the four winds, from one end of heaven to the other"; "I saw four angels standing on the four corners of the earth, holding the four winds of the earth"; "And shall go out to deceive the nations of the four quarters of the earth." So the Bible and science were thus found further to confirm each other. But, again, in process of time it came to be seen that neither the words of the Bible nor the phenomena of the earth taught what had been supposed; that the Bible taught nothing about the shape or other characteristics of the earth in these or other passages; and that the phenomena

of the earth, rightly understood, did not teach that it is a four-cornered immovable plain. Here, again, it is seen that all we should ask for is not harmony, but absence of contradiction. The examination of other cases would lead to the same conclusion.

The Bible does not teach science; and to take its language in a scientific sense is grossly to pervert its meaning.

Yet it is not correct in any of these cases to say that the language of the Bible does not express the exact truth; that it is accommodated to the weakness of the popular mind, to the ignorance of the unlearned. We are often told by some defenders of the Bible that it speaks inaccurately when it says that the sun rises and sets, or that it stood still upon Gibeon. But what is accurate speech? It is speech which conveys exactly the thought intended. Now, if to say that the sun rises conveys exactly the thought intended, wherein can this expression be called inaccurate? There is no intention to explain the cause of the fact of rising. This fact exists equally, whether produced by the sun's absolute motion in space or by the rotation of the earth on its axis. The meaning is, that the relative position of our horizon and the sun has changed in a certain way; and in stating that the change has taken place, there is not the remotest reference to the cause. In passing from Europe to the United States, we say that we go westward. But we are met by the assertion, uttered in a patronising tone of superior wisdom: "Oh no; you speak erroneously; you show that you are not acquainted with the real state of the facts; or if you are, you are speaking inaccurately for the sake of accommodating yourself to your ignorant hearers; you make a false statement because your hearers could not otherwise gain any idea from you on the subject. The truth is, that when you thought you were going westward, you were going eastward at a rapid rate; what you call your going westward was merely stopping a small part of the eastward motion you had in common with the surface of the earth." Now it would probably be hard to discuss this sage utterance in a perfectly respectful manner. But wherein does it differ from the tone of those who apologise for the "gross form" in which the Scriptures convey instruction, for their not speaking with "greater exactness," and the like? A

phenomenal truth is as much a truth as is the so-called scientific explanation of it; and words which accurately convey a knowledge of the phenomenon are as exactly true as those which accurately convey a knowledge of the explanation. Science has to do almost exclusively with the explanation; it is interested in phenomenal truths only on account of their relations to each other; while the Bible speaks solely of the phenomenal truths involved in natural science for their own sake, and never for the sake of the explanation of them or their scientific relations to each other.

Admitting these principles, which are so readily admitted in their application to the cases already considered, many difficulties usually regarded as of the gravest character at once disappear. For example, in Leviticus xi. and Deut. xiv. the divinely inspired lawgiver classes the coney and the hare as animals that chew the cud; he places the bat amongst the birds; he speaks of the locust, the beetle, and the grasshopper as flying creeping things that go upon all four. Now if these representations are to be taken as scientific statements, we must without hesitation say there is here a sad batch of blunders: for the coney and the hare do not chew the cud; the bat is not a bird; the locust, the beetle, the grasshopper, and other flying creeping things, do not go upon four, but upon six. But now suppose that the words used conveyed exactly the knowledge that was intended, are they not correctly used? We understand by "chewing the cud" bringing back into the mouth, for the purpose of being chewed, food which had been previously swallowed; but if those to whom the words in question were addressed understood by them that motion of the mouth which accompanies chewing, then they would recognise by this motion the hare and the coney as rightly characterised. So with the bat—in a scientific sense it is not a bird; it is a mammal; hence, if we are teaching natural history, we would grievously err in making such a classification. But in describing flying things which do not creep, the bat was rightly placed where it is. Two years ago the Legislature of South Carolina enacted that "it shall not be lawful for any person . . . to destroy any bird whose principal food is insects, . . . comprising all the varieties of birds represented by the several families of *bats*, whip-poor-wills, . . .

humming birds, blue birds," etc. Does this law prove that the Legislature did not know that the bat in a natural history sense is not a bird? They were not undertaking to teach zoology: they wished to point out the flying animals whose principal food is insects, and with all propriety and accuracy they did it. So "going on all four," when used in reference to the motion of animals, may fairly be taken as applying to the prone position of the animal which is common to the quadruped and the insect, and not at all to the number of feet. In this sense the phrase with perfect accuracy applies to the horizontal position of the locust and other insects; while the important natural history fact, that the insect has six feet, and not four, is perfectly immaterial.

In all these instances I think it has been made to appear that there is no contradiction; but he would be bold indeed who would claim that there is here harmony between science and the Bible. On the contrary, is it not most pointedly suggested that any exposition of Scripture which seems to show that natural science is taught, is thereby proved to be incorrect? For this reason, I may say in passing, I am strongly inclined to disbelieve the popular interpretations of the first chapter of Genesis, which find there a compendium of the science of geology.

As in the example above given, so in all other cases of supposed contradiction of the Bible by science, I have found that the fair honest application of such principles has caused the contradiction to disappear. I have found nothing in my study of the Holy Bible and of natural science that shakes my firm belief in the divine inspiration of every word of that Bible, and in the consequent absolute truth, the absolute inerrancy, of every expression which it contains, from beginning to end. While there are not a few things which I confess myself wholly unable to understand, yet I have found nothing which contradicts other known truth. It ought to be observed that this is a very different thing from saying that I have found everything in the Sacred Scriptures to be in harmony with natural science. To reach this result it would be necessary to know the exact meaning of every part of the Scriptures, and the exact amount of truth in each scientific proposition. But to show that in any case there is no contradiction, all that is

needed is to show that a reasonable supposition of what the passage in question may mean does not contradict the proved truth in science. We do not need to show that our interpretation *must* be correct, but only that it *may* be correct—that it is not reached by distortion or perversion, but by an honest application of admitted principles of exegesis.

It should be noted that the matters respecting which there are supposed to be inconsistencies between the teachings of science and the Bible are such as cannot possibly directly affect any moral or religious truth; but that they derive their importance to the Christian believer solely from the bearing they may have on the truthfulness of the Scriptures. In the name of Christianity, belief in the existence of people living on the other side of the earth has been denounced as absurd and heretical; but how is any moral duty or any doctrine of religion affected by this belief? unless, indeed, it may be from doubt it may cast upon the truthfulness of the Bible. And with this exception, what difference can it make with regard to any relation between ourselves and our fellow-men, or between ourselves and God and the Lord Jesus Christ, whether the earth came into existence six thousand years or six thousand million years ago; whether the earth is flat or round; whether it is the centre of the universe or on its edge; whether there has been one creation or many; whether the Noachian deluge covered a million or two hundred million square miles; and last of all, I may add, whether the species of organic beings now on the earth were created mediately or immediately?

After these preliminary observations, I proceed to discuss the main subject of this address.

Before answering the question, What do you think of Evolution? I must ask, What do you mean by Evolution?

When thinking of the origin of anything, we may inquire, Did it come into existence just as it is? or did it pass through a series of changes from a previous state in order to reach its present condition? For example, if we think of a tree, we can conceive of it as having come immediately into existence just as we see it; or, we may conceive of it as having begun its existence as a minute cell in connexion with a similar tree, and as having reached

its present condition by passing through a series of changes, continually approaching and at length reaching the form before us. Or thinking of the earth, we can conceive of it as having come into existence with its present complex character; or we may conceive of it as having begun to exist in the simplest possible state, and as having reached its present condition by passing through a long series of stages, each derived from its predecessor. To the second of these modes, we apply the term "Evolution." It is evidently equivalent to "derivation"; or, in the case of organic beings, to "descent."

This definition or description of Evolution does not include any reference to the power by which the origination is effected; it refers to the mode, and to the mode alone. So far as the definition is concerned, the immediate existence might be attributed to God or to chance; the derived existence to inherent uncreated law, or to an almighty personal Creator, acting according to laws of his own framing. It is important to consider this distinction carefully, for it is wholly inconsistent with much that is said and believed by both advocates and opponents of Evolution. It is not unusual to represent Creation and Evolution as mutually exclusive, as contradictory: Creation meaning the immediate calling out of non-existence by divine power; Evolution, derivation from previous forms or states by inherent, self-originated or eternal laws, independent of all connexion with divine personal power. Hence, if this is correct, those who believe in Creation are theists; those who believe in Evolution are atheists. But there is no propriety in thus mingling in the definition two things which are so completely different as the power that produces an effect, and the mode in which the effect is produced.

The definition now given, which seems to me the only one which can be given within the limits of natural science, necessarily excludes the possibility of the questions whether the doctrine is theistic or atheistic, whether it is religious or irreligious, moral or immoral. It would be as plainly absurd to ask these questions as to inquire whether the doctrine is white or black, square or round, light or heavy. In this respect it is like every other hypothesis or theory in science. These are qualities which do not

belong to such subjects. The only question that can rationally be put is, Is the doctrine true or false? If this statement is correct,—and it is almost if not quite self-evident—it should at once end all disputes not only between Evolution and religion, but between natural science and religion universally. To prove that the universe, the earth, and the organic beings upon the earth, had once been in a different condition from the present, and had gradually reached the state which we now see, could not disprove or tend to disprove the existence of God or the possession by him of a single attribute ever thought to belong to him. How can our belief in this doctrine tend to weaken or destroy our belief that he is infinite, that he is eternal, that he is unchangeable, in his being, or his wisdom, or his power, or his holiness, or his justice, or his goodness, or his truth? Or how can our rejection of the doctrine either strengthen or weaken our belief in him? Or how can either our acceptance or rejection of Evolution affect our love to God, or our recognition of our obligation to obey and serve him—carefully to keep all his commandments and ordinances?

True, when we go outside the sphere of natural science, and inquire whence this universe, questions involving theism forthwith arise. Whether it came into existence immediately or mediately is not material; but what or who brought it into existence? Did it spring from the fortuitous concurrence of eternally-existing atoms? Are the matter and the forces which act upon it in certain definite ways eternal; and is the universe, as we behold it, the result of their blind unconscious operation? Or, on the other hand, was the universe in all its orderly complexity brought into existence by the will of an eternal personal spiritual God, one who is omniscient, omnipresent, omnipotent? These questions of course involve the very foundations of religion and morality; but they lie wholly outside of natural science; and are, I repeat, not in the least affected by the decision of that other question, Did the universe come into its present condition immediately or mediately; instantly, in a moment, or gradually, through a long series of intermediate stages? They are not affected by, nor do they affect, the truth or falsehood of Evolution.

But, admitting that the truth of Theism is not involved in the

question before us, it may fairly be asked, Does not the doctrine of Evolution contradict the teachings of the Bible? This renders it necessary to inquire whether the Bible teaches anything whatever as to the mode in which the world and its inhabitants were brought into their present state; and if so, what that teaching is.

It does not seem to be antecedently probable that there would be any specific teaching there on the subject. We have learned that "the Scriptures principally teach what man is to believe concerning God, and what duty God requires of man"; and that "the whole counsel of God, concerning all things necessary for his own glory, man's salvation, faith, and life, is either expressly set down in Scripture, or by good and necessary consequence may be deduced from Scripture." But this does not include the principles of natural science in any of its branches. We have already seen that it certainly does not include the teaching of astronomy or of geography; it does not include anatomy or physiology, zoology or botany—a scientific statement of the structure, growth, and classification of animals and plants. Is it any more likely that it includes an account of the limits of the variation which the kinds of plants and animals may undergo, or the circumstances and conditions by which such variation may be affected? We would indeed expect to find God's relation to the world and all its inhabitants set forth; but he is equally the Creator and Preserver, however it may have pleased him, through his creating and preserving power, to have brought the universe into its present state. He is as really and truly your Creator, though you are the descendant of hundreds of ancestors, as he was of the first particle of matter which he called into being, or the first plant or animal, or the first angel in heaven.

So much at least seems clear—that whatever the Bible may say touching the mode of creation, is merely incidental to its main design, and must be interpreted accordingly. Well may we repeat with Calvin, "He who would learn astronomy and other recondite arts, let him go elsewhere."

It is further to be observed, that whatever may be taught is contained in the first part of the oldest book in the world, in a dead language, with a very limited literature; that the record is

extremely brief, compressing an account of the most stupendous events into the smallest compass. Now the more remote from the present is any event recorded in human language, the more completely any language deserves to be called dead, the more limited its contemporaneous literature, the briefer the record itself, the more obscure must that record be—the more difficult it must be to ascertain its exact meaning, and especially that part of its meaning which is merely incidental to its main design. As to the portions which bear on that design, the obscurity will be illuminated by the light cast backwards from the later and fuller and clearer parts of the Bible. But on that with which we are now specially concerned no such light is likely to fall.

To illustrate this point, I may refer to other parts of this early record. In the account of the temptation of Eve, we have a circumstantial and apparently very plain description of the being that tempted her. It was a serpent; and we read that “the serpent was more subtil than any beast of the field.” Further, it was a beast which was to go upon its belly, and whose head could be bruised. Surely, it might be said, it is perfectly plain that the record should cause us to believe that it was a mere beast of the field, a mere serpent, that tempted Eve. But to narrate the fall of man is not simply incidental to the design of the Bible; on the contrary, its chief design may be said to be to record that fall and to show how man may recover from it. Hence, from the later parts of the Bible we learn that the tempter was no beast of the field, as seems to be so clearly stated; but it was “the dragon, that old serpent, which is the devil, even Satan,” whatever may have been the guise in which he appeared to our first mother.

Then from the sentence pronounced upon the serpent, “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,”—from this it would seem to be clear that what we are here taught, and all that we are here taught, is that the woman’s son was to crush the head of the beast, whilst his own heel would be bruised; whereas we learn from books which come after that this sentence really contains the germ of the entire plan of salvation; and that the woman’s son who was to bruise the serpent’s head at

such cost to himself is Jesus the Saviour, who on Calvary through his death destroyed "him that had the power of death, that is, the devil." Now, since in these cases, where the meaning seems to be so unmistakably clear, and where the subject matter belongs to the main design of the book, and yet where the real meaning is so entirely different, as we learn from the later Scriptures, how cautious we should be not to feel too confident that we have certainly reached the true meaning in cases where the subject-matter is merely incidental, and where no light falls back from the later Scriptures to guide us aright!

The actual examination of the sacred record seems to me to show that the obscurity exists which might have been reasonably anticipated. It is clear that God is there represented as doing whatever is done. But whether in this record the limitless universe to the remotest star or nebula is spoken of, or only some portion of it, and if the latter, what portion, I cannot tell. And if there is an account of the methods according to which God proceeded in his creative work, I cannot perceive it. It is said *that* God created; but, so far as I can see, it is not said *how* he created. We are told nothing that contradicts the supposition, for example, that, in creating our earth and the solar system of which it forms a part, he brought the whole into existence very much in the condition in which we now see the several parts; or, on the other hand, that he proceeded by the steps indicated in what is called the nebular hypothesis. Just as the contrary beliefs of Calvin and ourselves touching the centre of the solar system fail to contradict a single word in the Bible, so the contrary beliefs of those who accept and those who reject the nebular hypothesis fail to contradict a single word of the Bible.

I regard the same statements as true when made respecting the origin of the almost numberless species of organic beings which now exist and which have existed in the past. In the Bible I find nothing that contradicts the belief that God immediately brought into existence each form independently; or that contradicts the contrary belief that, having originated one or a few forms, he caused all the others to spring from these in accordance with laws which he ordained and makes operative.

If that which is perhaps the most commonly received interpretation of the biblical record of creation is correct, then it is certain that the Bible, implicitly yet distinctly, teaches the doctrine of Evolution. According to this interpretation, the record contains an account of the first and only origination of plants and animals, and all that exist now or that have existed from the beginning are their descendants. If, then, we have the means of ascertaining the characteristics of these ancestors of existing kinds, we can learn whether they were identical with their descendants or not. If the early forms were the same as the present, then the hypothesis of Evolution or descent with modification is not true; but if they were different, then it is true. Now, not indeed the very earliest, but great numbers of the earlier forms of animals and plants have been preserved to the present day, buried in the earth, so that we can see for ourselves what they were. An examination of these remains makes it absolutely certain that none of the species now existing are the same as the earlier, but that these were wholly unlike those now living; and that there have been constant changes in progress from the remote ages of the past, the effect of which has been by degrees to bring the unlike forms of a distant antiquity into likeness with those which are now on the earth. Hence all who believe that the creation described in the Bible was the origination of the ancestors of the organic forms that have since existed, cannot help believing in the hypothesis of Evolution. This is so obvious that it is surprising that it has been so generally overlooked.

There seems to be no way of avoiding this conclusion, except by assuming that the so-called remains of animals and plants buried in the earth are not really remains of beings that were once alive, but that God created them just as we find them. But this assumption must be rejected, because it is inconsistent with a belief in God as a God of truth. It is impossible to believe that a God of truth would create corpses or skeletons or drift-wood or stumps.

If the interpretation which I have spoken of as perhaps most commonly received is rejected, then it may be thought that the Bible speaks only of the first origination of organic beings mil-

lions of years ago, but says nothing of the origin of the ancestors of those now on the earth; but that it may be supposed that when one creation became extinct, there were other successive immediate independent creations down to the beginning of the present era. There may be nothing in the Bible contradicting this supposition; but certainly there is nothing there favoring it. And if it is rejected in favor of Evolution, it is not an interpretation of Scripture that is rejected, but something that confessedly lies outside of it.

Or, in the next place, the interpretation may be adopted that the narrative in the Bible relates exclusively to the origination of existing forms, and that it is wholly silent respecting those of which we find the buried remains. It need hardly be said that, on this interpretation, as in the last case, there is nothing in the silence of the Scriptures that either suggests or forbids belief in Evolution as regards all the creations preceding the last. For anything that appears to the contrary, the multitudes of successively different forms belonging to series unmentioned in Scripture may have sprung from a common source in accordance with the doctrine of descent with modification.

When we reach the account of the origin of man, we find it more detailed. In the first narrative there is nothing that suggests the mode of creating any more than in the case of the earth, or the plants and animals. But in the second, we are told that "the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul." Here seems to be a definite statement utterly inconsistent with the belief that man, either in body or soul, is the descendant of other organised beings. At first sight the statement, that "man was formed of the dust of the ground," seems to point out with unmistakable clearness the exact nature of the material of which man's body was made. But further examination does not strengthen this view. For remembering the principles and facts already stated, and seeking to ascertain the meaning of "dust of the ground" by examining how the same words are employed elsewhere in the narrative, the sharp definiteness which seemed at first to be so plainly visible somewhat disappears.

For example, we are told in one place that the waters were commanded to bring forth the moving creature that hath life, and fowl that may fly above the earth; and the command was obeyed. And yet, in another place we are told that out of the ground the Lord God formed every beast of the field, and every fowl of the air. Now as both these statements are true, it is evident that there can be no intention to describe the material employed. There was some sort of connexion with the water, and some with the ground; but beyond this nothing is clear. Then further, in the sentence which God pronounced upon Adam, he says: "Out of the ground wast thou taken; for dust thou art, and unto dust shalt thou return." And in the curse uttered against the serpent, it was said: "Dust shalt thou eat all the days of thy life." Now Adam, to whom God was speaking, was flesh and blood and bone; and the food of serpents then as now consisted of the same substances, flesh and blood. The only proper conclusion in view of these facts seems to be that the narrative does not intend to distinguish in accordance with chemical notions different kinds of matter, specifying here inorganic in different states, and there organic, but merely to refer in a general incidental way to previously existing matter, without intending or attempting to describe its exact nature. For such reasons it does not seem to me certain that we have a definite statement which necessarily conveys the first meaning mentioned touching the material used in the formation of man's body. If this point is doubtful, there would seem to be no ground for attributing a different origin to man's body from that which should be attributed to animals: if the existing animal species were immediately created, so was man; if they were derived from ancestors unlike themselves, so may man have been. Just so far as doubt rests on the meaning of the narrative, just so far are we forbidden to say that either mode of creation contradicts the narrative. And as the interpretation suggested may be true, we are not at liberty to say that the Scriptures are contradicted by Evolution.

As regards the soul of man, which bears God's image, and which differs so entirely not merely in degree but in kind from anything in the animals, I believe that it was immediately created, that we

are here so taught; and I have not found in science any reason to believe otherwise. Just as there is no scientific basis for the belief that the doctrine of derivation or descent can bridge over the chasms which separate the non-existent from the existent, and the inorganic from the organic, so there is no such basis for the belief that this doctrine can bridge over the chasm which separates the mere animal from the exalted being which is made after the image of God. The mineral differs from the animal in kind, not merely in degree; so the animal differs from man in kind; and while science has traced numberless transitions from degree to degree, it has utterly failed to find any indications of transition from kind to kind in this sense. So in the circumstantial account of the creation of the first woman, there are what seem to me insurmountable obstacles in the way of fully applying the doctrine of descent.

But it is not surprising that, even if Evolution is generally true, it should not be true of man in his whole being. Man, as the image of God, is infinitely above the animals; and in man's entire history God has continually been setting aside the ordinary operation of the laws by which he controls his creation. For man's sake, the course of the sun in the heavens was stayed; the walls of Jericho fell down at the sound of the trumpets; manna ordinarily decayed in one day, but resisted decay for two days when one of these was the day of man's sacred rest; for man's sake the waters of the Red Sea and of the River Jordan stood upright as an heap; iron was made to swim; women received their dead raised to life again; the mouths of lions were stopped; the violence of fire was quenched; water was turned into wine; without medicine the blind saw, the lame walked, the lepers were cleansed, the dead were raised; more than all, and above all, for man's sake God himself took on him our nature as the second Adam by being born of a woman, underwent the miseries of this life, the cursed death of the cross; was buried; he rose again on the third day, ascended into heaven; whence, as both God and man, he shall come to judge the world at the last day. Surely then, I repeat, it is not surprising that, though man in his body so closely resembles the animals, yet as a whole his origin as well as his history should be so different from theirs.

Having now pointed out the probable absence of contradiction between the Scripture account of creation and the doctrine of Evolution, except in the case of man so far as regards his soul, but without having at all considered the probable truth or falsehood of Evolution, I proceed next, as briefly as possible, to state a few of the facts which seem to be sufficient at least to keep us from summarily rejecting the doctrine as certainly false.

First, as to the earth, in connexion with the other members of our solar system.

Some inquirers into the past history of this system have been led to suppose that at one time the whole of the matter now composing the various separate bodies may have existed in a nebulous state, forming a vast sphere with a diameter far exceeding that of the orbit of Neptune, the outermost planet; that this sphere rotated about its axis, and that it was undergoing gradual contraction. If there ever was such a sphere, it is claimed by some of those who have most carefully studied these subjects, that, in accordance with the laws by which God is now governing his material works, just such a solar system as ours would necessarily have resulted. As the sphere contracted, the nebulous matter would become more dense, and the rate of rotation would increase and would thereby increase the centrifugal force so that at length a belt or ring would be thrown off from the equatorial region of the sphere; which belt might continue to rotate as an unbroken mass, or, if broken, would be collected by the laws of attraction into a spheroidal body, which would rotate upon its own axis and would also continue to revolve in a path around the axis of the whole mass—both these revolutions being in the same direction, the axis of the new spheroid being not far from parallel with the general axis, and the orbit of revolution being not far from parallel with the plane of the general equator. This process would be repeated from time to time, new belts or spheroids with the same characteristics being successively formed. So from each of these spheroids, as it continued to contract, similar secondary spheroids might be successively formed, each assuming a shape determined by the rate of rotation. At a certain stage in the cooling, the nebulous matter would become a liquid molten mass,

ultimately solid. As the solid spheroid cooled still more, it would still continue to contract, but unequally in the interior and on the exterior, and thus the surface would be covered with successively formed wrinkles or ridges.

Now, in every particular, with very slight exception, the constitution of our solar system and our earth is exactly such as has just been described. It consists of a number of spheroids, each rotating on its own axis, and revolving around a central mass; and around the several primary spheroids are others which rotate on their axes, and revolve around their primaries as these do around the sun—all having a form determined by the rate of rotation; the primaries or planets all rotate on axes nearly parallel with the axis of the sun; the planes of their orbits of revolution nearly coincide with the equatorial plane of the sun; these revolutions and rotations are all in the same direction; in the case of Saturn, in addition to revolving satellites are revolving belts or rings. Coming to our earth, it exhibits the plainest marks of having once been in a molten state; the great mountain chains, which certainly have been formed during successive periods, are just such as would be formed by the wrinkling of the earth's crust caused by unequal contraction. Hence it would seem not unreasonable to conclude that, if the nebular hypothesis has not been proved to be certainly true, it has at least been shown to be probable. The number and variety of coincidences between the facts which we see and the necessary results of the supposition on which the nebular hypothesis is founded, are so very great that it must go far to produce the conviction that that supposition can hardly be wrong. As before intimated, the correspondence is not perfect; but the exceptions are not such as to disprove the hypothesis—they are merely the residual phenomena, which in the case of even the most firmly established principles await a full explanation.

If it should be objected that, as this scheme rests on a mere supposition, no part of the superstructure can be stronger than the foundation, and that therefore it must be supposition and nothing more throughout, I would say that this objection rests

on a misapprehension of the nature of reasoning on such subjects. Let us examine, by way of illustration, the method by which the truth of the doctrine of gravitation was established. At first it was the gravitation hypothesis merely. Newton formed the supposition that the heavenly bodies are drawn towards each other by the same force which draws bodies towards each other on the earth. He calculated what the motions of the moon and the planets should be if this supposition is correct. After many efforts, he found that many of these motions were nearly what his supposition would require. Even the first observed coincidence was a step towards proving the truth of his hypothesis; and as these coincidences multiplied, his conviction of its truth was increased; until at length he and all who took the trouble to become acquainted with the facts of the case believed with the utmost confidence that it was absolutely true. But even when this conviction was reached, there were still many phenomena which Newton could not explain on his hypothesis; but these residual phenomena, formidable as they were, did not shake his confidence, and should not have done so. Now, if Newton's gravitation hypothesis was entitled to his confidence on account of the number and variety of coincidences, notwithstanding the apparently inconsistent facts, ought not the nebular hypothesis to be entitled to similar confidence, provided there should be similar coincidences in number and variety, even though there remain some apparently inconsistent facts? And as the gravitation hypothesis rests upon a mere supposition in the same sense with the nebular hypothesis, ought the superstructure for that reason to be rejected in the one case any more than in the other?

It deserves to be remarked here that, after Newton had framed his hypothesis, he was led for years to abandon it, inasmuch as with the measurements of the earth on the basis of which he made his first calculations the motions of the heavenly bodies were utterly inconsistent with it.

To conclude, then, as regards the earth, I would say in the terms of one definition of Evolution—terms which have furnished to witlings so much amusement, but yet which so accurately and appropriately express the idea intended—that I think it very

probable that our earth and solar system constitute one case in which the homogeneous has been transformed by successive differentiations into the heterogeneous.

In the next place, respecting the origin of the various kinds of animals and organised forms generally, it has been supposed by some naturalists that existing forms, instead of having been independently created, have all been derived by descent, with modification, from a few forms or a single one. It is known that the offspring of a single pair differ slightly from each other and from their parents; it is further known that such differences or variations may be transmitted to subsequent generations; and it is self-evident that under changing conditions the varieties best fitted to the new conditions would be most likely to survive. Now, under the operation of these principles, it is held that all the immense variety of existing forms of plants and animals may have sprung from one or a few initial simple types.

In accordance with this supposition, the earliest inhabitants of the world would be very simple forms. Among the varieties produced in successive generations some would be more complex in their organisation than their parents; such complexity being transmitted would form kinds somewhat higher in rank; these in turn would give rise to others still more complex and higher; until at length at the present day the most complex and highest would exist. All would not undergo such modifications as to produce the higher forms; hence there would be at all times, along with the highest, every intermediate stage—though the existing low forms would differ in many particulars from their ancestors, unless, indeed, the conditions under which they lived remained unchanged.

Now, in the statement just made we have an outline of the facts made known to us by an examination of the animals and plants which are buried in the earth. The sediment in the waters all over the world sooner or later sinks to the bottom in the form of layers; this sediment contains remains of plants and animals carried down with it, and in various ways permanently preserves them. Of course only a very small part of the plants and animals could be thus preserved; still a few would be. If

we could gain access to these layers and examine their contents, we would obtain a knowledge of the successive generations of the past—the lowest layer being the oldest. It happens that a vast number of such layers have been hardened into rock, and have been raised from the waters where they were formed, and so broken and tilted that we have ready access to them. Not less than nine-tenths of the dry land, so far as examined, is composed of sedimentary rocks; and of these a large part contain the remains of plants and animals which were living at the time the rocks were formed. Of course it is not to be supposed that a complete series is known of all that ever were formed; still enough are brought to view to lead to the belief that from an examination of their contents we may obtain a fair knowledge of the history of the succession of animals and plants from an early period down to the present. We cannot go back to the beginning, but we can go a long way. The outline thus obtained shows us that all the earlier organic beings in existence, through an immense period, as proved by an immense thickness of layers resting on each other, were of lower forms, with not one as high or of as complex an organisation as the fish. Then the fish appeared, and remained for a long time the highest being on the earth. Then followed at long intervals the amphibian, or frog-like animal, the reptile, the lowest mammalian, then gradually the higher and higher, until at length appeared man, the head and crown of creation. The plants present a similar history—the first known being simple forms, like the seaweed, followed as we pass upwards through the later layers, by forms of higher and higher type, until we reach the diversity and complexity of existing vegetation. It is seen, too, that when a new type is first found, it does not present the full typical characters afterwards observed, but along with some of these also some of the characters belonging to other types. The earliest reptiles, for example, present many of the characters of the fish, the earliest birds and mammals many of the characters of the reptile; and so throughout the series. It is true there are many gaps, but not more than might be expected from the fact that the series of layers containing the remains is incomplete. When the layers show that the circum-

stances existing during the period while they were forming remained unchanged, then the kinds of animals underwent little or no change; but if the layers show rapid changes in climate, depth of water, etc., then the species of animals changed rapidly and frequently.

It would further follow, from the supposition under consideration, that, all animals being related to each other by descent, they must resemble each other. In the organic world every one knows that likeness suggests relationship, and that relationship usually accompanies likeness—the nearer the relationship, the closer generally is the likeness. Now, careful observation makes known to us that the various animals are surprisingly like each other. In the highest class of vertebrate animals, and also in man, for example, the skeleton, the nervous system, the digestive system, the circulatory system, are all constructed on exactly the same plan. If the skull of a man is compared with the skull of a dog, or a horse, each will be seen to be composed of the same bones similarly situated. Where the number differs, the difference will be seen to result from the growing together of several bones in one case which were separate in the others. So the human arm, the leg of the quadruped, the wing of the bird, the paddle of the whale, will be found to be formed on exactly the same plan. When the form of the animal is such as to render unnecessary any part belonging to the general plan, it is not omitted at once, but is reduced in size and so placed as not to be in the way, and then in other similar animals by degrees passes beyond recognition. And so it is with every part. There are also the same kinds of resemblance between the lowest animals; and, further, between any section of the lower animals and those which are just above or just below them in rank. Thus we may arrange all the forms in the entire animal kingdom, from highest to lowest, according to their resemblances; and while the highest is indeed very unlike the lowest—a man very unlike a simple cell—yet at every step as we pass through the entire series we find the resemblances vastly greater than the differences.

We thus have another set of facts which plainly would follow from descent with modification.

The existence of rudimentary organs is still another fact which would follow very naturally from this mode of creation, but which seems not very likely to have occurred if each species was independently created. For example, though a cow has no upper front teeth, a calf has such teeth some time before it is born. The adult whalebone whale has no teeth at all, but the young before birth is well supplied with them. In the blind worm, a snake-like animal, there are rudimentary legs which never appear externally. In the leg of a bird, the bone below the thigh-bone, instead of being double as in the general plan, has the shin-bone, and a rudimentary bone welded into it representing the small outer bone, but not fulfilling any of its uses. The blind fish of the Mammoth Cave have optic nerves and rudimentary eyes. So in the leg of the horse, of the ox, and indeed in many parts of the body of every kind of animal, will be found rudimentary organs, apparently not of the least use to the animal itself, but of great use to those animals which they closely resemble. All these facts are just such as the doctrine of descent with modification would lead us to expect, but which seem hard to understand on the supposition that each species was independently and immediately created.

Again, the changes through which an animal passes in its embryonic state are just such as the doctrine of descent requires. All animals begin life in the lowest form, and all in substantially the same form. Each at first is a simple cell. Beginning with this cell in the case of the higher animals, we find that, in the course of embryonic development, at successive stages the general forms are presented which characterise the several groups in which animals are placed when classified according to their resemblance to each other, ascending from the lowest to the highest. While it cannot be said that the human embryo is at one period an invertebrate, then a fish, afterwards a reptile, a mammalian quadruped, and at last a human being, yet it is true that it has at one period the invertebrate structure, then successively, in a greater or less number of particulars, the structure of the fish, the reptile, and the mammalian quadruped. And in many of these particulars the likeness is strikingly close.

The last correspondence which I shall point out between the results of the doctrine of descent and actual facts is that which is presented by the geographical distribution of animals. In this wide field I must confine myself to a few points.

By examining the depths of the channels which separate islands from each other or from neighboring continents, the relative length of time during which they must have been without land communication between them may be approximately ascertained. Where the channel is shallow, they may have formed parts of a single body of land recently; but where it is deep, they must ordinarily have been separate for a long time. For example, Great Britain is separated from the continent of Europe by a very shallow channel; Madagascar is cut off from Africa by one that is very deep. In the East Indies, Borneo is separated from Java by a sea not three hundred feet deep; it is separated from Celebes, which is much nearer than Java, by a channel more than five thousand feet deep. Now, if the theory of descent with modification is true, it should be expected that in the regions recently separated, the animals would differ but slightly; in regions separated long ago, the animals would differ more widely; and that, just in proportion to the length of separation. This is exactly what we find in the regions mentioned. The animals of Great Britain differ little from those on the adjacent continent; while the animals of Madagascar differ greatly from those of the neighboring coast of Africa. There are few kinds found in Java which are not also found in Borneo; while on the other hand very few kinds are found in Celebes which exist in Borneo. So it is the world over.

And this is not all. When we examine the kinds of animals which have recently become extinct in each country, we find that they correspond exactly with those which now inhabit that country; they are exactly such as should have preceded the present according to the doctrine of descent. For example, lions, tigers, and other flesh-eating animals of the highest rank, are found scattered over the great Eastern continent. In Australia the kangaroo and other pouched animals like the opossum abound, but none of any higher rank. In South America are found the

sloth, the armadillo, and other forms which we meet with nowhere else on the earth. Now, in the Eastern continent we find buried in caves and the upper layers of the earth extinct kinds of lions, bears, hyenas, and the like, which differ from existing kinds, but yet closely resemble them. But we find nothing like the kangaroo or other pouched animals, or like the sloth or armadillo. Whereas if we examine the extinct buried animals in Australia, we find they are all pouched, with not a single example of anything of as high rank as the lion or the bear; and if we do the same in South America, we see extinct kinds of armadillos and sloths, but nothing at all like the animals of Asia or Australia. It is equally true that wherever regions of the world are separated by barriers which prevent the passage of animals—whether these barriers are seas, or mountain ranges, or climatic zones—the groups of animals inhabiting the separated regions differ more or less widely from each other just in proportion to the length of time during which the barriers have existed. If the barrier is such that it prevents the passage of one kind of animal and not another, then the groups will resemble each other in the animals whose passage is not prevented, and will differ in the rest. All this is independent of climate, and other conditions of life: two regions may have the same climate, may be equally favorable to the existence of a certain group of animals; but if these regions are separated by impassable barriers, the groups differ just as previously stated.

In view of all the facts now presented—the way in which animals have succeeded each other, beginning as far back as we can go, and coming down to the present; the series of resemblances which connect them from the lowest to the highest, exhibiting such remarkable unity of plan; the existence of rudimentary organs; the geographical distribution of animals, and the close connexion of that distribution now and in the past;—in view of all these facts the doctrine of descent with modification, which so perfectly accords with them all, cannot be lightly and contemptuously dismissed. In the enumeration made, I have been careful to state none but well-ascertained facts, which any one who wishes to take the time can easily verify. Are not the coincidences such as

must almost compel belief of the doctrine, unless it can be proved to be contradictory of other known truth? For my part I cannot but so regard them; and the more fully I become acquainted with the facts of which I have given a faint outline, the more I am inclined to believe that it pleased God, the Almighty Creator, to create present and intermediate past organic forms not immediately but mediately, in accordance with the general plan involved in the hypothesis I have been illustrating.

Believing, as I do, that the Scriptures are almost certainly silent on the subject, I find it hard to see how any one could hesitate to prefer the hypothesis of mediate creation to the hypothesis of immediate creation. The latter has nothing to offer in its favor; we have seen a little of what the former may claim.

I cannot take time to discuss at length objections which have been urged against this hypothesis, but may say that they do not seem to me of great weight. It is sometimes said that, if applied to man, it degrades him to regard him as in any respect the descendant of the beast. We have not been consulted on the subject, and possibly our desire for noble origin may not be able to control the matter; but, however that may be, it is hard to see how dirt is nobler than the highest organisation which God had up to that time created on the earth. And further, however it may have been with Adam, we are perfectly certain that each one of us has passed through a state lower than that of the fish, then successively through states not unlike those of the tadpole, the reptile, and the quadruped. Hence, whatever nobility may have been conferred on Adam by being made of dust has been lost to us by our passing through these low animal stages.

It has been objected that it removes God to such a distance from us that it tends to atheism. But the doctrine of descent certainly applies to the succession of men from Adam up to the present. Are we any farther from God than were the earlier generations of the antediluvians? Have we fewer proofs of his existence and power than they had? It must be plain that, if mankind shall continue to exist on the earth so long, millions of years hence the proofs of God's almighty creative power will be as clear as they are to-day.

It has been also objected that this doctrine excludes the idea of design in nature. But if the development of an oak from an acorn in accordance with laws which God has ordained and executes, does not exclude the idea of design, I utterly fail to see how the development of our complex world, teeming with co-adaptations of the most striking character, can possibly exclude that idea.

I have now presented briefly, but as fully as possible in an address of this kind, my views as to the method which should be adopted in considering the relations between the Scriptures and natural science, showing that all that should be expected is that it shall be made to appear by interpretations which may be true that they do not contradict each other; that the contents and aims of the Scriptures and of natural science are so different that it is unreasonable to look for agreement or harmony; that terms are not and ought not to be used in the Bible in a scientific sense, and that they are used perfectly truthfully when they convey the sense intended; that on these principles all alleged contradictions of natural science by the Bible disappear; that a proper definition of Evolution excludes all reference to the origin of the forces and laws by which it works, and therefore that it does not and cannot affect belief in God or in religion; that, according to not unreasonable interpretations of the Bible, it does not contradict anything there taught so far as regards the earth, the lower animals, and probably man as to his body; that there are many good grounds for believing that Evolution is true in these respects; and lastly, that the reasons urged against it are of little or no weight.

I would say in conclusion, that while the doctrine of Evolution in itself, as before stated, is not and cannot be either Christian or anti-Christian, religious or irreligious, theistic or atheistic, yet viewing the history of our earth and its inhabitants, and of the whole universe, as it is unfolded by its help, and then going outside of it and recognising that it is God's PLAN OF CREATION, instead of being tempted to put away thoughts of him, as I contemplate this wondrous series of events, caused and controlled by the power and wisdom of the Lord God Almighty, I am led with pro-

founder reverence and admiration to give glory and honor to him that sits on the throne, who liveth for ever and ever; and with fuller heart and a truer appreciation of what it is to create, to join in saying, Thou art worthy, O Lord, to receive glory and honor and power; for thou hast created all things, and for thy pleasure they are and were created.

