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# The Bible and Science:

A COURSE OF SIX LECTURES

DELIVERED AT THE MADISON AVENUE PRESBYTERIAN CHURCH, NEW YORK.

BY

J. W. DAWSON, LL.D., F.R.S., F.G.S.,

*Principal of M'Gill College, Montreal.*

TO WHICH IS ADDED

## THE BIBLE ON THE SIDE OF SCIENCE,

BY REV. DR. HOWARD CROSBY,

*Chancellor of the University of the City of New York.*

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*THE BIBLE ON THE SIDE OF SCIENCE.*

BY REV. DR. HOWARD CROSBY.

*From a Newspaper  
Report*



## THE BIBLE AND SCIENCE.

BY DR. J. W. DAWSON.

### *GENERAL RELATIONS OF THE BIBLE TO SCIENCE.*

WITH REFERENCE TO CONSTANT PROGRESS,  
ADAPTATION, AND TYPE.

THE subject on which I here propose to engage your attention in these lectures is the "Relation of the Bible to Science," and in doing so I shall endeavour to adhere as closely as possible to this title. It is a topic which has of late claimed a great deal of public attention, and in the remarks I shall have to make I shall seek to direct your notice to its consideration from the point of students of science rather than that of theologians. You will thus understand my point of view, and in addition I wish to explain that when the idea of delivering this course of lectures was first suggested to me, I entertained the notion of a course of lectures to be addressed to students rather than to a more general audience. I shall, therefore, in this, as well as in all my succeeding lectures, keep this intention closely in view, while at the same time I shall try to give as clearly as possible all points which may be of special interest to a more general audience.

It has been said that science teaches the method of nature and not its laws, religion its cause and not its method, and there is much truth in the distinction; but it does

not contain the whole truth, or else it would be comparatively easy to draw a line between the domains of religion and science, which reasonable men would not desire to overpass; but it is quite true that the infirmity of nature is liable to create a strong prejudice in the minds of scientific men against divine intervention, as they term it, and on the other hand, theology may attribute to God capricious modes of action not in harmony either with science or with revelation. Revelation stands where it always was, while science is continually moving, and if we attempt to compare them with each other our comparison must be with revelation as in itself fixed, and with science as it is at the point of progress which it may happen to have reached at the time of which we are speaking or writing. It is very much like a traveller viewing the great Palisades of the Hudson. If he stands continually in one place and looks at them they always seem the same, but if his position is changed new grandeur rises before him, and, though stable, they appear in varying forms. Thus it is with science and religion. The student standing upon one point of view sees the Bible always the same. He who is drifting with the current of science may see it in other aspects.

I would therefore state at once that while the man of science is justified in pushing his researches without reference to religious beliefs, the Christian also may believe in the Scriptures without the aid of

science, yet it is in the highest interest of science to respect religion, and imperative in those who would defend it against the attacks of false science to know what true science teaches, while it is more especially incumbent on all intending to be teachers of Christianity to know well the tendencies and results of science, as far as they are in any way connected with the Scriptures.

In the treatment of this question, the first statement that I would make is that there are certain general relations between the Bible and science, certain relations of the most general character possible. I would define this in this way. It is said, and truly said, that we have no right to expect any direct revelation in Scripture either of natural facts or scientific principles. Natural facts are open to observation, calculation, and reasoning, and do not need to be revealed to man; neither would a revelation of them prematurely, before men were able to understand them, be at all desirable, because it would only cramp instead of developing the powers of man. Even if desirable, it is difficult to see how it would be practicable. And a constantly growing scientific revelation to suit the capacities of successive ages would be a thing quite unworthy of God, because unnecessary and unsuitable to the progress and growth of the human intellect. The field of revelation obviously lies in the spiritual domain, and perhaps there can be no surer scientific test of a true revelation from God than to ask the question: Does it refuse to commit itself to scientific theories, but insist on those things insoluble by the unassisted reason? While we have no right to expect that the Bible shall be a revelation of science, yet there may be some points on which it is necessary for the Bible to speak, and on which it may appear to trench upon the domain of science. There are incidental references in the Bible, and there is a history of creation in the Bible. The incidental references are made with a view of illustrating spiritual truth by natural things, and the Scriptural writers, asserting an analogy between the natural and spiritual worlds, took advantage of natural facts to strengthen and enforce spiritual truths. This was all the

more important because it is so hard to understand spiritual things or give us external and outward demonstrations of spiritual and inward truths. Now, where the Bible does this, its accuracy is remarkable—unexampled, I believe, in any other literature. So much is this the case, that if you will take a page of any of our modern poets and one from the Bible, you will find errors in one and not in the other. Now we may be content, perhaps, to ascribe this to divine guidance, under which these writers wrote, but I would suggest also the reasons which follow.

First, the habits of a people familiar with nature, and living constantly in the midst of natural objects. We, in our artificial life, trusting too much to literature, can scarcely conceive the condition of the minds of the old writers of the Scriptures, or even of the writers of India or Greece, who had no previous literature to guide them, and were obliged to go to nature for that inspiration which they did not get from God. If we ourselves were a little more disposed to look to nature and to God, and less to man, to his writings, machines, and industrial progress, our minds would come nearer harmony with those of the Scriptural writers than they are apt to do. Young men should not take so much from previous writers and so little from observations of their own. The study of nature would bring them more into harmony with God.

Secondly, it seems not to have occurred to these writers to give any theory of natural phenomena. Why? Because it was their business to attribute them directly to the law of God. That is the true position of the theologian. It is the true position of the Bible writers. It is the position of the theologian to-day, and is not antagonistic to science.

Thirdly, the absence of all that superstition which converts natural things into a mythology. The old Hebrew writers viewed with horror the idea of any subordinate gods. They were, therefore, shut out from all that is called mythological in classical writers, and that is one reason, undoubtedly, for their truthful representa-

tion of nature. They saw it as the work of one God, and they had no need to introduce the wild dreams of mythology.

Fourthly, that veneration for natural truth developed among a people who regarded all nature as an emanation from the one God. If you take the point of view of the inspired writers of the Scriptures—that all nature is an emanation from God—there grows up in the mind that veneration for nature which we find in the Scriptures. Whether we attribute it to those causes or to divine inspiration, the fact remains the same. Even in long detailed passages—like the thirty-eighth chapter of Job, for instance—we find an accuracy which is worthy of a revelation from God.

But there is another point of contact. I have been speaking of incidental references. There is another point of contact of the Bible with nature to which this statement does not necessarily apply. We may say that in its ordinary references the Bible may be non-committal as to theories, and truthful as to facts. It may speak of phenomena without reference to causes. But we cannot say this of such a position as that taken in the first chapter of Genesis. Here we find an attempt to give a statement of the origin of the world. This trenches on the domain of method. It must be a revelation or a myth. For instance, the Scripture tells me that Solomon was the son of David, and Rehoboam the son of Solomon; and if I should find monumental evidence that Solomon was the son of Rehoboam, and David the son of Solomon, then my monumental evidence, if it was contemporary, would be held to be a contradiction of the Bible, and would be so. But we know that has not been the fact, and that monumental evidence which has been found has only proved it. When the Bible gives us history it subjects itself to monumental evidence. But you will say, "What monumental evidence have we for the first chapter of Genesis?" There is a succession of beds of rocks which have been formed at different periods since it was first created; and a succession of plants, one after another; and a succession of animals, from their beginning up to the modern times. This is a series of facts derived from

monumental evidence—not from stones inscribed by man, but from evidence which God himself has inscribed. Here, we see, is the history which God himself has given, and if we take the history of the first chapter of Genesis, we can apply this and see whether it is true or not. Supposing we fully understand both, we shall be in a position to put the two together. In so far as this, the Scripture has submitted itself to monumental evidence. The writer, long before science was so far advanced, has committed himself to a history of the earth. Up to one hundred years ago, no one knew with any certainty that there were records preserved in the earth that could tell, with God's own handwriting, whether his servant—his supposed servant—had been telling the truth or a lie. In many other places where the first chapter of Genesis is referred to we find this same statement in regard to the history of the world.

Now it will not do for us to take our stand upon the theory that the Bible was not to be committed to science. Here it is different; and the great error is often made by theorists and writers on this subject when they confound these two distinct things, and talk of the first chapter of Genesis as not to be compared with science. But common-sense teaches us that this is not the way to treat this question. It will suit for the incidental points which may be true as records of facts which present themselves to the eye, but not with regard to those which man could not see.

This is a hard test for the Bible. Many of its friends are frightened at that test. I do not think they should be. I think they will find that Scripture will stand even that hard test, and that it will come, after a time, to be regarded as one of the proofs of the inspiration of Scripture.

Second, the Bible is bound to hold a certain testimony to the unity of nature. We know that one of the prevalent evils of our race down to our own time is that of the worship of natural objects. When men are losing the knowledge of the true God, and are not enlightened by science, they are naturally afflicted with a superstitious dread of those objects of nature which may be

either prejudicial or hurtful to them. Hence the sun, moon, &c., become gods or symbols of gods. Hence arises a state of mind, a superstition or polytheism, which reduces man below the level of the things or forces he adores, instead of lifting him up to God. Our own ancestors and the modern heathen were and are in this state. From this it was necessary for a revelation to raise them; hence we find the great Hebrew law-giver grasping the whole material of heathen idolatry and bringing it within the grasp of his monotheistic theology. This pervades the whole of the Bible. Hence Moses placed man on the throne of the creation, and lays beneath his feet all the created things which the blinded nations worshipped. This is the vast achievement of revelation; but when we see in our own time even cultivated men content to avow themselves creatures of blind natural forces, or to fall into pantheism, we cannot but be thankful for this. If the Bible had not already taught the unity and uniformity of nature, it is doubtful if our science would have emerged from the crudities of Greek or Roman philosophy. We do not know how much we are indebted to the Bible in this respect, and I don't know how we can know it unless we think of those mythologies which, even in enlightened Athens, Paul preached against, and which have clung to the human mind, making men the slaves of a multitude of natural gods who rule over them, representing only these powers of nature which are ruled by God. The Bible has delivered us from that, and for this great deliverance science itself is under the deepest obligations.

There is another aspect of a less agreeable character, and this is, that the monotheistic theology is obliged to hold God responsible for all nature. He cannot be relieved of the responsibility for destructive animals, storms, and all the other things which are relegated to the domain of malignant demons. They, as well as the gentle rain, must be the work of the one God. Most of us are familiar with and appreciate difficulties; but when we consider how hard it was for the wisest minds of antiquity to advance so far, we can better appreciate the boldness of the stand taken in inspired

Scripture in descriptions or illustrations of divine acts. If we are not to hold this, we may be obliged to rob nature of its unity, or we may be obliged to fall into hopeless atheism, or into that abject superstition which is always in dread of the unknown. I am not speaking of the Bible now in its moral aspect, but in its scientific aspect.

Thirdly, there are points of positive union between the Bible and science. Thus, the Bible is joined with science in the affirmation of the constancy of natural law. God has enacted the ordinances of heaven and earth; he has established the heavens for ever. They all continue to this day according to his order. The uniformity of nature, as under natural law expressing the will of the Creator, is as certain a dogma of the Scriptures as of science. If the Creator is perfect, his action must be uniform; anything else would be unworthy of him; and this is precisely the ground held by the Bible. It is true that the Bible may be said to be anthropomorphic, yet it is difficult to see how the Scriptures could speak to the hearts of men without taking emblems of God from human things. Man is made in the image and likeness of God, and, therefore, so far anthropomorphism is the proper thing. But what shall we say of miracles, and what shall we say of prayer? We shall have occasion by-and-by, in the course of these lectures, to look at these things more minutely. In reference to these points—the constancy of the natural law—the Bible takes here a broader view than that of the mere materialist. Even the materialist has to admit that he lives in what is to him a world of miracles. I think the most advanced man of science, when you have put this to him, is the most ready to admit this fact, because science is surrounded by mysteries on every side. This being so, the materialist himself, looking merely at material nature, may be said to live surrounded by things utterly incomprehensible to him. Further, it is true that he often finds himself in the presence of forces and processes beyond his control, and which he knows very well that if he had more power he could manage without infringing natural laws. In other words, he finds



himself in the presence of some difficulty which he cannot overcome. He does not believe that it is insuperable. He may find some specialist who knows the subject better than he, and ask the man to solve it. He prays to his fellow-man because his fellow-man has more knowledge than he. So, if there is a God who has made law, God should know the most about it.

We may pray to God, expecting him, through his infinite knowledge, to grant us things which, to our short-sightedness, seem almost impossible. Therefore the attitude of the man of science is that a man ought to feel the necessity of prayer if he believes in a God. The idea of prayer is inseparable from the idea of God. Nay, more, we can have more confidence in him as a God working by law.

In like manner in regard to miracles. If it is held that God has ordained and arranged all things from the beginning, it is hard to believe—one almost cannot believe—that miracles could have been performed under these circumstances. Yet the Bible tells us of them. If we hold a God who has not taken the trouble to perfect things at the beginning, then we shall not see anything seriously to interfere with miracles. Science holds that God is a God who works by law, and that if he works miracles these shall come under some higher part of his will and law. That is all that science has a right to demand, and all, I think, that legitimate science will demand. Prayer, in a Scriptural sense of it, is simply an appeal to One whose knowledge of and power over his own works enable him to work results inconceivable to us. There might be higher ground taken on this subject, but I take that that science takes.

There is one further thought to which I wish to direct your attention for a very few moments. The idea is prevalent among scientific men, and among some who are not scientific men, that every new discovery which teaches a law or sequence of cause and effect in any operation of nature, pushes God further back. They think that we will push God outside of his works. Now this is a feeling altogether unreasonable. If I say that God has enacted a law of gravita-

tion, and that that accounts for a great many things which I have seen going on, there is no reason why I should say he was absent from it. None would doubt that God was acting in and through the law. Just as much are things going according to his will when they are acting according to the law he has appointed. Herodotus tells a story that was related to him by some Egyptian priests, that in Egypt they had no need to pray to God for rain, for the river Nile overflowed its banks and watered the fields. A little physical geography would have told them if the rain did not fall in the upper regions of Abyssinia they would not have any overflow. Just so in natural things. If we find our way to do anything, we have only found out so much of God's operation as to enable us to work under him in that particular thing instead of trying to work against him. I would have you combat this notion and keep clear of it as one of the scientific errors as well as unscientific errors of our time.

In the next place, the Bible holds with science the doctrine of progressive development and elevation of nature. This is implied in the account of the creative work in the first chapter of Genesis. It begins with an account of the humbler inhabitants of the waters, and next of man. The Bible goes further back in this respect, however, than scientific fact can reach at present, toward the beginning, and it stretches in prophetic anticipation further toward the end. It treats of an arrest of development by the fall of man. Here it is to be observed it bases its practical solution of one difficulty of the gloomy philosophies of Spencer and Mill from the apparent evils of the past and present ages of the world. We know that God alone sees the end and the beginning. His plan is not to be understood from the study of one short period, nor are the designs of God to be judged altogether by the human criteria. These considerations made it necessary for the Bible to deal with progress in nature. It would not do for the Bible to leave it to be supposed that nature was not a progressive thing, and that God's work of creation has not gone on from its beginning to its completion in man, or is

not to go on to its entire completion; and in this respect the Bible scans this field of the continuity and progress of nature from a higher point of view than that of its scientific critics. It is further to be observed that this doctrine of progress in nature all along held by the Bible has only recently been established in science. The first tendency of the great physical discoveries of the last century was to lead to the notion of an unvaried condition of things under an invariable law. Only since the rise and growth of geology has the idea of continual change and progress fixed itself in men's minds, and this has brought before us the grand idea that while all natural laws continue as they were, under the operation of natural law God is carrying on a progressive work, so that in no one day is this world of ours exactly the same as it was previously. There is a constant progress going on to unknown results in the end. Science, it is true, with a sort of zeal like that of new converts in matters of this kind, rushes on further with its process of evolution. This doctrine of evolution is hardly in the domain of science, but it is likely in no very long time it will recede to a point nearer the position of the old book which has led the way in this direction as it has in other directions.

A further point of the relation of the Bible to science is adaptation in nature. The idea of an all-wise Creator involves this, and here again it is necessary that the Bible as the agent of God shall maintain use and adaptation in nature. This in modern times science has so keenly perceived that it has pushed it into the most popular hypothesis of the day, with strange inconsistency, however, denying the evidence of design. But if we look again at the Scripture in this matter, we shall find that it occupies here also a somewhat broader standpoint. The teleology of the Bible is distinct. Let us analyze it for a very few moments, and compare it with the teachings of natural science. It resolves the designs of God into three parts. First, the higher aim in creation according to the Scripture is the pleasure of the Creator himself. God saw the things he made, and that they were

good. They were created for his pleasure. This is the highest end. When Darwin, perhaps not wisely, asserts that the production of any structure for the purpose of beauty alone would, if proved, be fatal to his theory, he unwittingly takes up a position which in the eye of the Bible would be absolutely atheistic, as denying the chief end of God in his works. And yet Darwin in his later works has been obliged to recede so far from this that he may be said to have given it up. The instinct of beauty is too strong in man to allow most scientific students to go so far. A curious illustration is given to us in that strange man—whether you acknowledge him a theologian or not—Strauss, who, in his last production, strove to embody this in his conception of the cosmos. He had the strange pantheistic conception of the cosmos working and for itself, and yet, after all, this is only a vague statement of the truth presented by the Bible with regard to the design of God. The second object is the good of man, who is the shadow and image of his Maker, and has dominion over this world. In science a like conclusion may be drawn, that man is the archetype of nature, and that he enjoys the power of ruling natural things by virtue of his will and reason.

By virtue of this, and in harmony with his own ideas of nature, he has a right, as I already stated, to be anthropomorphic in his view of God. Those who hold man himself as derived from blind physical force, or as only a great and leading part of the Pantheistic All, should be the last to deny such an anthropomorphism either in science or religion.

Finally, the Bible represents God as caring for the welfare of all his lower creatures, not by daily details, but by a grand provision of natural law. To science all this becomes the wonderful and complicated adaptation of all the elements of nature to each other, which it is the joy and glory of science to discover and expound, and which it manifests even when it refuses to admit that intelligent purpose or design can be discerned therein: but in regard to this objection to the idea of design, I am sorry to say some men of science look at it from too

partial a point of view, and have even ridiculed in our day, and spoken of it in the strongest terms, as if it were something utterly absurd. These men in doing this do violence to their own facts, since the severest kind of induction must lead us to the conclusion that such adaptations as we perceive, especially in the more complicated animal and vegetable structures, are incomprehensible on any presumption of blind concurrence.

\* Even Mill, who seems at one time to have taken ground against design, in his last essay takes up this argument, admits its force, and I was struck with the fact that after canvassing the various arguments in favour of the existence of a God, he rejected one after another, and comes in the end to take up the argument of design, and after scanning it critically, says this argument has inductive value, especially when we look at the complicated series of adjustments which exist in the structure of the higher animals, and he seems to say that to his own mind this is the only remaining argument for the existence of God.

Now, it is a curious fact in connection with this that this is the only kind of proof which the Bible itself condescends to say in regard to the existence of God. It takes for granted the existence of God usually, as something which no sane man denies; but where it does venture—or condescend, I should say—to argue the existence of a God, this is the one argument it presents to us. For instance, where the Apostle Paul says, “From the creation of the world, his invisible things, even power and divinity, are plainly seen by the things he has made,” he holds exactly what John Stuart Mill admits in his essay on Theism. The only thing he can believe is this fact of his power and divinity being seen in the things that he has made. Is not this a curious coincidence, that the Word of God, when it does deal with these natural matters, takes hold of them in the right way, in a way which we find meets the case of the most pronounced sceptic of our own time just as such as those who were the contemporaries of these Bible writers?

I have one other point. In addition to

this general head of law and adaptation; the Bible recognises type or plan in nature. It brings out the likeness of man to God, and his position as the archetype in nature. It is full of harmonies between natural and spiritual things, so that it links all things together, one with another, and with the pattern in the Divine Mind. It does this in such a simple way that a child can understand it. The Bible is full of the plan or type presented in nature binding together the whole with the mind of God. Science in our day is full of this same idea, but it parts company with the Bible when the position of derivationists is reached. However, even if it could be proved that many things are derived from one another, it would not invalidate the idea from the Scriptural point of view. But any attempt of this kind to deduce all things by evolution from a few types or inorganic atoms, made without the creative power, is not and cannot be anything resting upon a scientific basis of induction.

On the other hand, the Bible takes its stand on the Divine Will, and holding that this will necessarily operates by law and by a wise prescience, it has a logical and consistent theory of the universe, perfect in its adaptability to all that may appear from the investigations of nature. We cannot represent such a system as either making God a worker of unnecessary miracles, or making him an arbitrary ruler, or a mere workman or artificer. The Scripture holds to plan or type in the mind of God harmonizing with each other all the things in nature and all the things in the spiritual world; and if this fails to correspond with the apparent results of science, this proceeds either from the ignorance of men of science with regard to God's laws, or an imperfect representation of the divine truth given by the friends of the Bible.

My aim in this introductory lecture is to show that there is common ground for the student of the Bible and the student of nature. If they fall into antagonism, it must be because one or the other has become too narrow and partial. But I dwell in this lecture merely in generalities. It remains to show that these general state-

ments are true, and that the Bible is true to nature. In doing this I shall have to select out of the vast mass of matter available for it only a few leading points, and I shall try to meet as many as possible of the difficulties and misconceptions that are prevalent either among Christians or scientific students.

#### HEAVEN AND THE HEAVENS.

THE GENESIS AND CONSTITUTION OF THE UNIVERSE, ACCORDING TO THE OLD TESTAMENT AND SCIENCE.

I HAVE endeavoured so far to direct your attention to some general views with reference to the relation of science to the Bible. My present subject is the view which the Scripture gives us of the universe as a whole. Now, although man in his simplest and least cultivated state may possibly limit his view to the little space of earth on which he lives, it is probable that there are only very few members of the human family, very few tribes or nations of men, who hold such a position as that, because so soon as man upturns his eye and looks upon the heavens, he finds himself the tenant of a limitless universe, and the alternations of Summer and Winter, day and night, calm and storm, impress him with awe and admiration, or excite his gratitude or fear. Even when science, however, with the telescope and the spectroscope, has enabled the astronomer to weigh and measure the heavenly bodies, man stands astounded at the inconceivable vastness of the firmament. Our first question is, how does the Bible treat this manifestation of God in the heavens? The first word of the Bible is about the material universe. The first article in the creed of inspiration is one that makes a statement concerning the importance of the outward world, for the heavens are recognized first and the earth afterwards. I know of nothing in the Word of God more impressive than this prompt recognition of the fact that this material universe is something of the greatest importance. You will bear in mind that the word "earth" in the Bible is

specifically defined in the first chapter of Genesis to mean that land which man inhabits. It places all things that are above, under the general designation of the heavens, the heights or high places. Now these heights or heavens are divided into three regions, which are designated as follows:—The first is the atmospheric heavens, or the expanse; the second is the astronomical heavens, comprising the stars and planets; and the third is the highest heaven, the abode of God's personal presence, and of higher spiritual intelligences. These three regions are specifically and clearly designated by all Bible writers from the first. The consideration of the atmospheric heavens introduces us to meteorology, one of the most complicated studies known to science, leading us to consider the intricate contrivance provided for the fertilizing of the earth, the vast amount of water suspended over our heads, and the enormous volume of the rains, of running streams and rivers which are but the overflow of the great reservoir. Many writers contend that Moses meant a solid expanse when he speaks of the firmament, and this supported on the mountains as pillars. This, however, is an absurdity so manifest that it could never be credited by any man who ever saw a shower of rain. In a recent American book I have found a quaint and ridiculous translation to the effect that the gods ordered a hammered plate to be set in the midst of the waters. Now, that the idea of extension rather than fixity is conveyed by the Hebrew word which has been translated firmament is shown by the expression, the stretching out of the heavens in connection with this beautiful conception taken from the rolling up of the clouds or the rolling up of the heavens like a scroll. The old fgment that the firmament consisted of a solid arch supporting the stars and planets may have recommended itself at one time to astronomical philosophers of antiquity, but such a theory could scarcely be applied to the clouds, because it is clear that if any observèr has noticed the manner in which clouds gather in the sky, he must have seen the impossibility of the firmament being composed of a solid arch. The Bible

in its references to the sky has many beautiful poetical figures telling of the natural appearance of things, but certainly applying no theory as to the constitution of the atmospheric heavens. Ezekiel and other inspired writers have referred to the firmament in appropriate though singular language. Job compares the sky to molten metal, and in the thirty-sixth chapter he says:—"For he maketh small the drops of water; they pour down rain according to the vapour thereof. With clouds he covereth the light; and commandeth it not to shine by the cloud that cometh betwixt." In that same passage there are a number of verses with references of this kind. For instance, where he says, "Out of the south cometh the whirlwind." It is a long passage, and I cannot read the whole of it. It is perhaps the most beautiful in any literature in its description of the phenomena of the atmosphere.

Here the question of prayer comes to us in a concrete and specific form, not in a general form as during our remarks last night. "It is useless to pray for rain, since it is under the control of physical laws," has been said by physicists of our day. Elijah prayed, and the heavens gave rain. This is recorded in the Scriptures. But the Bible takes quite as strong ground as the physicists on the side of law. The weather is not the sport of good demons and of malignant demons. God arranged all that. According to the Bible, too, these laws of God are impartial, for it rains on the evil and the good alike. But the Bible knows a Lawgiver above and beyond who feels for the condition of men. Elijah had faith in prayer, but Elijah could laugh at the priests who would pray to their sun god. Elijah knew that the priests of Baal worshipped the sun—nothing but a creature of God; yet he would pray to God with reference to rain. So there may be some truth in both these doctrines. There is a Hindoo legend which is apt to the subject: "The earth is the mother of all things. It produces all things for man. It produces all things out of its bosom, and all things go back to her bosom. Therefore, the earth is a great god, and we will

worship her. But then this earth is a dry and barren thing. Without water to fertilize it, the earth could not do much. Therefore we worship the water. But without the mild yet great and powerful agency of the sun, the earth and the water would not avail much, so the sun is the greatest god of all, and we worship it. Thus, if no higher God were known, we might well, like the old Syrians, worship the sun.

But, now, consider the position of the materialist who says it avails nothing to pray for rain. Elijah would not have thought of asking that the sun should give rain. He knew that the sun was under law, but he believed that the law-giver was accessible to prayer, and in this his position was rational as well as one of faith. This is the true position of the Scripture here. We might retort on those whoridiculous prayer, that it is they, and not the Bible, that interpose a wall of brass between us and heaven. We can imagine, for instance, the scorn with which a philosopher of the time of Hume would greet the statement from a merchant that he could stand in his office in London and direct instantaneously his agents in China and America. The great man who founded this lectureship (Prof. Morse) was one of the miracle-workers in electricity. That good and wise man saw no good reason for not believing in God and believing in his electrical power still. I would have you bear in mind, too, that the Apostle tells us that Elijah was a man of like passions with ourselves. Elijah had faith in God. That same power that Elijah wielded, any man may wield.

Let us ascend to the second or astronomical heavens. The beginning, when the heavens were created, you will observe, was an indefinite time; but the arrangements of the heavenly bodies are not specified until the fourth of the creative days, whereas light was the work of the first of the creative days. This corresponds with the probable natural order. There has been miraculous intervention even in the case of the heavenly bodies. Of Joshua's great miracle it is said that no day was

like it. The only other of this kind is that recorded by Isaiah; and no attempt is made to explain either by natural causes. Nor can we supply this deficiency with reference to any natural explanation of them; both remain to us as great mysteries as a steam-engine to Joshua or Isaiah. We may suggest possible explanations, but we know of none with any certainty.

A use is made of the sidereal heavens in certain prophetic passages where they are spoken of. These prophecies are emblematic, rather than literal. This is shown by reference to Ezekiel's prophecies, and the same explanation ought to be applicable to our Lord's prophecies in the twenty-fourth chapter of Matthew. Some of these relate to the present, some to anticipations of the future of the universe. Interpreters have scarcely done justice to St. John. Some of his pictures are the most gorgeous in the world. Take his picture of the harpers harping by the glassy sea, the sea of glass mingled with fire. It is the eventide of the world: the sun of immortality shining along a smooth sea which has forgotten all its storms, and glowing with the fire of heaven itself, while those who have been rescued, tune their harps to the same song which Moses sang. It is a picture, a beautiful picture, of eventide—the evening of the world—and indicating in this evening of the world, the position of the men who had escaped from those tempests. But the apocalypse of John is full of pictures of this kind. He tells us of the sun blotted out of the heavens, black as sackcloth, and the moon reduced to that ruddy hue which we see in lunar eclipses, and meteoric stones raining on the earth like figs from a tree shaken by the wind, and the atmospheric heavens rolling up like a scroll. This points to a final decay of the solar life and heat, to the slackening of the earth's motion, the renewal of our system and the possibility of a change, implied by the quantity of meteoric matter haunting our system. Surely the writer of this Book of Revelation must have been inspired. All the references to these things in the Scriptures are not only in accordance with scientific truth, but worthy of a revelation from the God who made them.

Let us now proceed to say something of the third or spiritual heaven, as there are three heavens, which form our present subject. When we ascend to the third or spiritual heaven, we might suppose that we should leave science altogether behind. Yet there are some points of connection here. I would direct your attention to the actual doctrine of Scripture about the highest heaven. In popular language, we mix up our idea of it with figures of Canaan, &c. This is not so in the Bible, and ought not to be in our theology. I am looking at this from the position of science, and not from the position of theology. I am rather giving that which science demands from you.

While it is the doctrine of Scripture that God is everywhere present and pervades the whole universe, yet there is a definite place where his presence is specially manifested. I think when we find men who speak of a mere pervading influence as representing God, and then when we find many rude systems of theology have limited God to a mere single place, that Scripture has the right to keep itself free from both of these extremes; and the way is to assert the all-pervading influence of God, and also a heaven of heavens. Now our Lord, who is the manifestation of God, and without whom God would be unknowable, says that he came from it and returns to it. He speaks of it as a paradise, as his Father's house with many mansions, and as a distinct place from earth. It was an actual place. The angel Gabriel required a definite and specified time to reach this earth from it.

All these statements certainly imply to us that the Scriptural writers held that this heaven is not a vague, uncertain, shadowy idea, but it is a "somewhere," it is substantial and a fact. It is further beyond the visible sidereal heavens, and is tenanted by spiritual beings whose nature as yet can be expressed only by comparisons and figures. It is a place of special manifestation of God and of his power and ways, but it does not limit or contain his energy. It is expressly said that the Heaven of Heavens cannot contain him. It does not place a limitation upon him. Thence his power pervades all

things. It is the place whence spiritual messengers are sent everywhere.

Lastly, we are told that in the resurrection we shall put on spiritual bodies, as distinguished from the earthly or natural bodies, and their nature is shadowed forth to us through the resurrection of our Lord, and the bodies of the angels. The angels are not disembodied spirits, but have spiritual bodies. And the conditions of heaven are further said to descend to earth, so that heaven and earth become one, and the new heaven and new earth are permanently identified. I would like that idea to be before your minds as something to think of. The idea seems necessary to our conception of a spiritual and personal God; and I think it is an idea that would have much effect in solving the difficulties of scientific men at the present day. The pantheist believes in an all-pervading power of some kind, but he cannot conceive of this as a person, while the heathen limits this power to that of mere men. The Bible combines both ideas, giving us a local habitation for the indwelling of God. At the same time it is said that the Heaven of Heavens cannot contain him, and his presence is everywhere.

Now is this heaven an actual place, or is it only a name for space beyond the limit of the visible heaven? If somewhere, where is it? Is it merely a general name for all those abysses beyond this universe, which include and surround it, or is it a name for some region or place? Science asks that question; but if theology should ask it of science, although science would give no answer, it would prefer the latter alternative. For just as we have in our system a glowing sun as our centre, and as the stars are suns to other systems, it is a matter of not unreasonable conjecture that there exists somewhere in space a visible centre for the whole universe, and all around which all these worlds have their prodigious and almost eternal circles. Analogy lends force to the conjecture which astronomers are very slow to say anything about, or at least to insist upon, because they have no facts which make it a certainty. If the world were to continue long enough to accumulate

in future ages accurate observations, we might hope for something to indicate the possible direction and distance of this visible heaven, and perhaps instruments might be invented to catch some rays of its light for mortal eyes.

This may never be achieved, and we must for the present be content to know that science and revelation, standing on their respective fields, both point upward and inward to a mysterious centre of the universe of God, whence emanate powers that extend to the utmost limits of space, and where dwells glory inaccessible, which eye hath not seen, neither hath it entered into the heart of man to conceive. I believe, therefore, the Scriptural idea of the third heaven, as a space existing beyond the limits of the universe, is one that may be said to be a scientific idea, although it is one that science cannot as yet prove by definite facts. There is, however, a curious connection, which it is worth while to point out to you here, as I have a few minutes remaining, between the revelations of geology to us in regard to past states of the world, and the idea presented by Scripture that the earth is at a subsequent time to be included in the conditions of the spiritual world, and to be inhabited, perhaps, by persons having spiritual bodies, as distinguished from natural bodies, and that is this: that, if we look back in the world's history as presented to us by geology, we can see that in each particular stage of its history we might have absolutely insoluble problems presented to us with respect to its possible future.

Let us suppose, for instance—it has been put in this way by a recent Scotch writer—that we, as intelligent beings, were introduced to a world in which there was no living thing—in which all things were dead, inorganic matter, and the most beautiful things of that world would be of the crystalline forms that minerals can assume; and let us suppose that some higher intelligence than ours should come and say to us, “This world, in its present condition, shall not always remain so. It is the will of God that at a future time a new power shall be introduced, and that new power shall be the power of vegetable life.” Now, how

would it be possible to give us any idea, in terms of the mineral, of what would be the condition of a vegetable? He might tell us as the sun shone upon a beautiful crystal and made it sparkle before our eyes, so the sun shining upon this new creation would not only make it shine and sparkle, but grow and increase. But how difficult would it be for such an intelligence to give us such a conception of the wonderful and varied life of the vegetable kingdom if he had nothing but the terms of the mineral kingdom to express himself in? But suppose, again, we were to come to earth at a later time, and saw vegetable life in abundance, and there was no animal life; and suppose our teacher were to come to us and try to explain that at a future time there would be animal life, and that this life would manifest strange and different powers from the vegetable life; he would, perhaps, try to explain that these animals have the roots inside of themselves instead of in the ground, and, instead of being fixed to the earth, could move about, and would try to explain to us in terms of the vegetable what an animal would be. How difficult it would be to understand it! And then suppose we came to a world inhabited by the brute animals, and were to be told, again, that the world was to go into another state; and this teacher of ours was to try to explain to us, in the terms of the brute animals, what kind of creature man was to be, and what kind of things he was to do: how could he give us an idea of our cities and villages and our religion by any kind of ideas derived from the brute animals? It would be extremely difficult, as you see, if we knew nothing about men.

Now, obviously that is the same difficulty under which the Scripture writers lie when they explain the spiritual world, and when they explain to us the condition of that third heaven from which our Lord came, and from which angels come to us with rare and occasional visits, with very different bodies from what exist in this world. If that visible heaven exists, if that place of strange and wonderful manifestation of God exists, and if the things that exist in that place represent to us in a certain way the

things that are to take place to ourselves and our own bodies in the future, that we, as spiritual beings, are to exist in that renovated condition of this earth, we have that same sort of difficulty, you see, that our supposed informant would have in describing our world in the terms of the mineral, or vegetable, or brute kingdoms. And we cannot expect to have any clearer opinions of it than what we find in Scripture by the use of terms that belong to things here; and we can easily see that when we look back to this plan as revealed to us in the history of the earth it is possible that our future standard may be precisely of that kind, and that this may be thus obscure to us because we do not possess the terms and ideas by which it can be explained.

I would affirm, therefore, that the possibility of the conditions of a third heaven ultimately becoming the condition of the earth is not an unscientific supposition, but is warranted by what we know of the past history of the earth, and the stages through which God has brought us; but the main practical point is that I think you should look into the Scripture testimony in regard to that heaven, and try to deliver it from that unscientific vapour that hangs about it in popular thinking and speaking; and, as an example of this, and a sad example, I lay before you the statement of the old veteran, Strauss, in his last work. He says: "No man having a clear conception in harmony with the present standard of astronomy can represent to himself a Deity enthroned in Heaven." Now, astronomy shows that God may exert his power from a great dominant centre of creation wherein his throne may be in the same figurative sense in which the earth itself is said to be his footstool.

My subject, I think, has been a little outside of my own special scientific work, which has relation rather to the earth than the heavens, but I could not overlook it in a course of lectures of this kind, although I confess I am not so well able to treat it as some of the other subjects. I have, however, endeavoured, though imperfectly, perhaps, to show you that the origin and the nature of the Heaven in the Bible are true to facts as we know them.



*GEOLOGY AND GENESIS.*

RELATIONS OF THE ACCOUNT IN GENESIS  
TO THE SCIENCE OF THE EARTH.

AT no point has modern science appeared to impinge more heavily on the Bible than in the relations of geology to the narrative of creation in Genesis. No triumph of inductive science is greater than that by which it has given us a connected history of the stages of the genesis of the earth and its inhabitants through a long series of ages anterior to man, and on no point has the Bible appeared to insist more strongly than on its six creative days. The apparent difference has given rise to a swarm of attempts at reconciliation, and there has been no want of stern denunciation of the impiety of science on the one hand, and of the bigotry of theologians on the other. Happily, however, so much light has now been cast upon the subject that few intelligent men see any contradiction between the conclusions of geology and the doctrine that "in six days God created the heavens and the earth." The subject is, however, well worthy of some attention; if for nothing else, as an example of how the greatest apparent difficulties may fade away when boldly encountered.

Nothing can be more surely established as the basis of scientific induction than the vast length of the periods revealed by the strata of the earth's crust. Some geologists are, indeed, not content with that enormous stretch of 100,000,000 of years which is regarded as the greatest possible time which may have elapsed since a solid crust first formed on the cooling earth. To understand this, we may condense into a few propositions the great leading results of scientific investigation of the earth.

1. The widest and most important generalization of modern geology is that all the materials of the earth's crust, to the greatest depth to which we can penetrate, are of such a nature as to prove that they are not unchanged and primitive rocks, but the results of the operation of causes of change now in progress. They may be such things as conglomerates, sandstones, shales, and slates, all of which are the

débris of older rocks, broken down into pebbles, sand, or mud; or they are limestones made up of the ruins of corals and shells, or coal and ores, accumulated by the agency of vegetable matter; or they may be substances analogous to the lavas and ashes of modern volcanoes; or they may be rocks that are aqueous in their origin, and now hardened and altered by heat. But everywhere we see the evidence of change under natural laws still in force.

2. This being ascertained, we can next affirm that, in regard to the manner in which successive deposits from water have been piled upon each other, a regular succession can be traced in the strata or beds of the earth, giving us a chronological sequence of deposits extending throughout the whole time since the sea first began to receive into its basin the débris from the wasting land.

3. This series of rock formations acquires an immense increase of scientific value from the fact that organic remains of the animals and plants inhabiting the earth at the different stages of its progress are revealed in the successive deposits, and can be compared. Further, these buried remains indicate successive dynasties of life different from that now existing, and from each other, so that we can divide the geological history not merely by a series of beds of rock alternating with each other, but by a series of faunas and floras which have occupied the earth successively from the dawn of life until now.

4. The lapse of time embraced in this geological history of the earth is enormous. It is difficult to give an idea of this without entering into details, out of place here. A few facts must suffice. In the modern period which includes the time of man, and the lower animals, his contemporaries, such facts as the growth of coral reefs and the deposit of sediment at the mouths of rivers give a lapse of time to be measured by tens of thousands of years. Passing to a single formation of older date—the coal formation—this, as seen in Nova Scotia, shows in a single section eighty beds of coal overlying each other, and about one hundred fossil forests all successive. Without reckoning the time necessary

for deposition of the thousands of feet of sand and mud hardened into stone that inclose these beds, the growth of so many peaty beds, often of great thickness, with the growth of so many forests, and the time involved in the emergences and subsidences of the land necessary to their appearing as they now do, must have required ages compared with which the modern period dwindles into insignificance. The accumulation of even one bed of coal may have required as long a time as that covered by human history. Again, the numerous great limestones of immense thickness, and covering vast areas, are composed altogether of shells of mollusks or corals. Such limestones give us for the lowest estimate of time the lapse of vast ages. Geological time thus grows upon us the more that we examine,

Turn now to the first chapter of Genesis, and see how we are to reconcile these vast periods with a creation in six days. It will not serve our purpose here to say that the Bible is not intended to teach science, and need not be correct as to minor details. It commits itself to an order and a time. \*We cannot escape by saying that the story is a myth to vindicate the fourth commandment, or we shall have to hold very loose notions of the truth of Scripture. We cannot say that the vague term "the beginning" covers the geological ages, because there is no chaotic condition between these and the human period. Further, when we look into the narrative, the creation of animals begins in the fifth day of the Bible series, so that even if we suppose our geological chronology to extend to a little before the introduction of animal life, it will cover at most three of the six days, and perhaps the seventh.

The explanation of the whole mystery is, that the creative days themselves are long periods. It has not been left to geologists to discover this; for independently of the traditional impression prevailing throughout antiquity that the world had existed through long pre-human times, there are venerable Christian authorities—as Augustine, for instance—who on grounds of a purely natural character held this doctrine. Let us look at the evidence.

1. The perfectly indefinite phrase, "in the beginning," places no limit in backward extension of time to the commencement of God's creative week. But the six days seem to limit the period occupied in the arrangements of the earths and of the solar system. Let us consider how this stands.

2. The Hebrew word for day does not necessarily mean a natural day. In Genesis first and fifth it is used in two senses; the earlier creative days preceded the institution of the natural day, and in Genesis ii. 4 the whole creative week is called one day.

3. Many internal difficulties occur in the hypothesis of natural days. One of these is the interval which in chapter ii, appears to have occurred between the creation of the man and that of the woman. Others arise from the difficulty of replenishing the earth with plants and animals in the course of a few natural days.

4. In Psalm xc. (attributed to Moses, and certainly written in the style of his poetry in Deuteronomy) one day of Jehovah, relating to human history, is said to be a thousand years; relating to creation it must be much longer.

5. The seventh day is not said to have had a morning and evening, nor is God said to have resumed his work on the eighth day. Hence the seventh day is the period of man in which we still live. Our Saviour sustains this view of God's Sabbath in his remarkable expression, "My father worketh hitherto, and I work."

6. The fourth commandment, as explained by Moses, requires the supposition of long creative days. It cannot be meant that God works six natural days and rests on the seventh as we do, but it may be intended that on God's seventh day we should have entered on his rest, and that the weekly Sabbath is an emblem of that rest lost by the fall and to be restored in the future.

7. This explanation has the support of the writer of the Epistle to the Hebrews, whose argument in his fourth chapter has no force unless on the supposition that God entered into a rest of indefinite duration, which man lost by the fall, retaining only the week's Sabbath as a shadow of it, but which is to be restored in Christ, who is already entered

into his rest, of which the Lord's day is in like manner a foreshadowing.

8. There is further good reason to believe that the use of the Greek word *aiones*, with reference to the creation, in Hebrews i. 2, and in Ephesians iii. 11, refers to the creative days as indefinite periods, and that these passages should be translated in accordance with this view, while we have this authority for rendering the passage of Genesis i. by the word *æon* rather than by day.

These things being considered, it is worthy the attention of theologians whether it would not be better to abandon the literalism of medieval theology, and return to the patristic authority and to the internal harmony of Scripture itself in this matter, and thus to put Moses in accordance with modern science as to the length of the creative days, which there seems good reason to believe he himself intended to assume.

We have occupied some time with this discussion of the length of creative days. Let us now look at the order of the work in so far as the earth is concerned, and taking with us the idea that the days of creation are very long *æons*—the days of a creation with which even in human testimony one day is as a thousand years. That an order of creation is given is in itself a remarkable fact. Still, in that Moses might cover all the ground of ancient heathenism, it was necessary to place the work of creation in some order, and none so appropriate as the order of time. I do not here discuss how this revelation of the creative work was communicated, whether in visions corresponding to days, or otherwise. That it was a divine revelation we may rest assured, unless we can believe that the contemporaries of the writer had already made such progress in physical and natural science as to have reached to a scientific cosmogony. The sacred record opens with a "beginning," a time when neither the heavens nor the earth existed except in the mind of the Eternal. To us it is as equally impossible to conceive an eternal succession of natural things as an entire absence of matter and force. Yet it is plain that one or other must be assumed,

and if we exclude God, we place ourselves in an absolute dilemma. On the other hand, believing in an eternal spiritual first cause, we fall back on him, and with Moses say, "God created." Further, the tendency of all modern geological and astronomical research has been to point by positive indications to a beginning. Geology shows us that the animals and plants which are our contemporaries did not always exist, and we can trace back animal and vegetable life perhaps to their origin on our earth. Even the rocks and continents have their geological dates, and there are none of them that we cannot assign to an origin in geological time. So in astronomy, the moon, once apparently a similar mass, has withered into a dry volcanic cinder destitute of water and air. The earth and Mars are advancing to the same stage. Jupiter and Saturn, from their great mass, are further behind. On the one hand we can look back to a time when the whole solar system was in a state of incandescence or vaporous diffusion, and forward to a time when the sun himself will have dissipated all his energy. The prophet of creation introduces us to the earth at a stage where it was without form and void, or literally desolate and empty, and darkness was on the face of the abyss—a stage precisely corresponding with the one indicated by physical and chemical science, when the earth had not yet ceased to be a whirl of vapour, and before it became a shining, sun-like ball with a photosphere. And now in the sacred record the Almighty Word breaks the silence, and with the fiat, "Let there be light," the actual work of reducing the old chaos to order and life begins, and begins with scientific appropriateness in the introduction of those great forces of which solar and nebular light may be taken as the type and expression. Here I may pause to notice a double relation in the first chapter of Genesis—one to science, the other to the most ancient myths by which religion had been corrupted in the days of Moses. Breath and spirit have been synonyms in all languages, and the Spirit of God has been identified with idolatries of the four winds of heaven. So with reference to light

and the dawn of twilight, all great divinities in the myths of antiquity, and perhaps the dawn as the mother of day, the greatest and most widely adored of all. They, too, must come into their places in the Word as the handmaids of the Almighty. One perceives, in studying this magnificent revelation, that it has not yet been put to its full use by the teachers of modern times, but perhaps it has triumphs yet in store, not only in reference to the old myths that still reign in the dark places of the earth, but with reference to the more aggressive superstitions of modern infidelity.

In the state to which the earth had been now brought it was a sunlike star—

“Sphered in a radiant cloud, for yet the sun was not,”

as Milton says, gathering this truth in his poetic insight from the Bible, in advance of science. Further, the Hebrew word used here for light includes the allied forces of heat and electricity which with light emanate from the solar photosphere. That marvellous and incomprehensible ether which, though theoretically continuous, vibrates, and whose vibrations are so regulated as to give light with its prismatic colours, and heat with all its vast powers, and that still more strange and wonderful actinic power which puts in motion all the vital machinery of plants, and so is the material source of life. If science can anywhere find evidence of design in the relations of physical agencies; if it can anywhere find a stepping stone to lift it from the grossness of atomic matter, surely it is here. Fittest of all emblems of God is this heavenly light; and when first it pulsed through space, then, if there were anywhere in the universe eyes to behold it, and minds to think of it, might it be said that there existed a physical analogue of Him who is Light. But another stage has to be passed through, and the earth becomes a dull yet heated mass, with a dense pall of airy, vaporous substance lowering over it and constantly descending, in acid rains on its heated surface, to be as constantly thrown off in vapour. Modern solar physics, aided by the spectroscope, and modern chemistry, calculating the action of

the elements of an earth melted with fervent heat, have alone enabled us to attach due significance to these stages of the creative work.

When next the historian lifts the veil we see a universal ocean, with the spirit or breath of God brooding on the face of the waters. Here again we have a stage in the geological history of the earth, that in which its waters were condensed on its surface, forming a shoreless sea, before these foldings of the crust which formed the first dry land.

I need not here refer to the production of the atmosphere, to the arrangement of the heaven or luminaries, except to remark that the order is that of nature, since the atmospheric firmament must first be cleared in order to the heavenly bodies coming into due relation to the earth, and since the nebulous mass would require long time before the sun and the larger planets were established in their present relations to our globe, and the superabundant cometary and nebulous matter of the planetary spaces got rid of. It is in perfect accordance with what we know from scientific investigation that the dry land should appear before the completion of these processes; but it is an unexpected and hitherto unexplained statement that vegetation should make its appearance before the final arrangements of our planetary system. Let us consider these points. The natural cause of the appearance of the first dry land is explained in geological investigations. We left the earth at the beginning of the first creative æon with a solid crust supporting a universal ocean. But as time advanced, the gradual cooling of the earth's mass would make this crust too small for its shrunken size. At length it would collapse and fall into folds, giving ridges of land and shallow oceans. That this process actually occurred, not once only, but repeatedly, we know from the folded and crumpled condition of the rocks along their old lines of upheaval. The time required for this, relatively to the contemporaneous changes in other parts of the solar system, has not, so far as I am aware, been calculated, but some rough approximation to it could no doubt be made. The question would be, supposing a vaporous

condition of our system, what would be the time necessary to enable the earth to acquire a solid crust, relatively to that needful to enable the sun to condense to itself all the nebulous matter within its reach, and to enable the larger planets to assume their present form. When that calculation shall be made, I have no doubt that it will vindicate Moses in giving precedence to our little earth, which has not only completed its planetary form, but gone through a vast series of geological changes, while in this work the Sun and Jupiter and Saturn have still much to do.

Let us observe here, in passing, that the elevation of the first dry land was not merely a barren act leading to no consequence. With that great change began numerous phenomena—the metamorphism of rocks; the denuding action of the rains, waves, and breakers on the land; the deposit of true sedimentary strata in the sea; the unequal thickening of the earth's shell; the establishment of the great oceanic currents; and, in short, all those ceaseless causes of change by which, in the progress of geological time, our continents have acquired their present form and structure. We may also turn for a moment to the other aspect of these questions. Man, according to Genesis, as in all the traditions of antiquity, is earth-born, but the earth is not on that account a great goddess, nor is the sea the domain of other gods. The sea is God's, and he made it. His hands also formed the dry ground, and accordingly he named them both. This naming has a further significance. God called the dry land earth, the same term used in the first verse for the whole world. The earth, therefore, of the following passages and of Scripture generally, is specially the dry land. Hence the earth is said to be laid on foundations and pillars, and supported above the water and out of the water and by the water, expressions perfectly accurate when we understand that the continents constitute the earth referred to. The elevation of the dry land is perhaps more frequently referred to in the Bible than any other cosmological fact, and while all have been unfairly dealt with, this has been pre-eminently so. It has been left out of

sight that the word earth is by the terms of the record restricted to the dry land, and therefore that it is this, and not the whole globe, that is referred to when God's power in upholding it above the waters and establishing it so that it cannot be moved is magnified. When thus rightly understood, nothing can be more thoroughly accurate than the Bible language respecting those elevated portions of the crust arched and pillared above the waters, and in which we have our secure abode, except when the earthquake causes the earth to tremble. Take, for example, this part of the work as it appears in the Hymn of Creation, "Thou laidest the foundations of the earth that it should never be removed; Thou coveredest it with the deep as a garment; the waters stood above the mountains; at Thy rebuke they fled; at the voice of Thy thunder they hasted away; mountains ascended, valleys descended to the places Thou hast appointed for them. Thou hast appointed their bounds that they may not pass, and return not again to cover the earth." In Job xxviii., also, we have nearly all of the phenomena of the earth recited in a manner at once grand and truthful.

In the Mosaic account, the land elevated above the waters is in the same creative day clothed with vegetation. Here a difficulty arises, for science as yet knows nothing of vegetation which preceded by a whole period the introduction of animals; and that view which overlooks the earlier animals, and supposes the plants of the Devonian and carboniferous periods to be there referred to, certainly involves a straining of the record. Further, the vegetation referred to is expressly said to have included not merely the lower and humbler groups of plants, the *Deshe* or grass of our version, but the higher phænogams, having fruit and seeds, and trees as well as the herbaceous plants. This is not in accordance with the record of the rocks as at present known to us. The oldest stratified rocks contain remains of humble animals of the sea. Land plants did not appear as fossils until a comparatively late geological time. Either there is some discrepancy here between the two records, or there is an old

plant-bearing formation yet undiscovered. That the latter should be the case would not be surprising. Vegetable life naturally precedes animal life as being the sole source of the food of animals. We know that land existed from a period at least as old as that of the first animal remains, and it would be somewhat anomalous if it remained during all the earlier periods of geological time unclothed with vegetation. There may, therefore, be in this direction discoveries in store for geology, though, from the highly metamorphic condition of the oldest sediments, it is probable that no remains may exist of this primeval vegetation. There may be some reference to this past vegetation in the statement in Genesis, chapter ii., that God had not caused it to rain upon the earth, but that a mist went up and watered the face of the ground. Now it happens that we know, by the evidence of rain-marks, that there was rain as far back as the primordial ages, so that this would place the first plants as far back as the Laurentian age of geology, and there are some chemical indications in the rocks of this age of an abundant vegetation, of which no distinct remains are left to us.

The introduction of vegetable life forms a new era in the world's history. The earth brought forth plants, yet they were made after their species, and, when made, a new relation was established between solar light and the earth, by which not only a new beauty was given to the world, but a new power of producing those marvellous organic compounds on which animal life, with all its further endowments, would be founded. If one looks at the structure of a leaf with its vessels and fibres drawing into it the soil water taken up by the stem; its microscopic sac-like cells piled loosely on each other, its hygrometric breathing pores opening and shutting with every atmospheric change, and considers that this delicate organ is fitted for exposure to wind, sun, and rain, and through all to avail itself of undulations transmitted through 96,000,000 of miles of space, by means of which it can convert all the gases of putrescent matters from the soil and air in the endless variety of products of the plant, we have

before us a marvel of adaptation perhaps inferior to no other in affording an inductive argument for design.

The Bible surely accords with the highest science when it claims the vegetable kingdom, with all its wonders, as a product of Almighty power, and it touches a chord which every physiologist can appreciate when it dwells on the fruit and seed, the organs of the new and wonderful power of vegetable reproduction, perpetuating the plant after its kind; a subject we might be tempted to dwell on here, but that it will come up again in connection with animal life.

#### THE CREATION OF ANIMALS.

##### THE ORIGIN AND HISTORY OF LIFE ACCORDING TO THE BIBLE AND TO SCIENCE

The subject of this lecture is the origin and progress of animal life as we find it brought before us in the two records of the Bible and of geology. After the completion of the inorganic creation in the fourth creative æon, the story of the great work proceeds thus:—"And God said, Let the waters swarm with swarming creatures, and let birds fly on the surface of the expanse of heavens. And God created great reptiles, and every living, moving thing, which the waters amply brought forth abundantly after their kind, and every bird or flying thing after its kind." We may here note, in the first place, that the waters bring forth the first animals—a fact which is in accordance not only with the actual fact that the lower forms of animal life most abound in the sea, but also brings before us the idea that the previous physical creation was preparatory to the organic creation. As the land was suited and prepared for the plant, so the waters for the animal.

Again, the first animals belong to the lower grades of creatures. The term "Sheretz" used to denote them does not refer—as we would infer from the translation, "creeping things," of our version—to their locomotion, but to their reproduction. It implies their fecundity, and thus again implies that low organization which admits of reproduction in its simplest forms. This

is a matter worth thinking about, because the lower and simpler forms of animal life are those which can multiply in the greatest variety of ways and in greatest abundance. A comparison of passages in the Pentateuch, and, especially, in the list of animals in Leviticus, will show that this term applies chiefly to the invertebrate animals, with a few of the humbler members of the vertebrate group. I have taken a great deal of pains to find out all I could about the similar kind of creatures mentioned in the eleventh chapter of Leviticus, and it warrants the statement that the animals introduced in the beginning of the creative work were of a humble type. One peculiar group of animals is specially characterized in the recapitulation or second member of the clause—the “Tanninim,” translated “great whales” in our version, but which a comparison of passages shows as really the general name for the larger and more formidable reptiles, of which the crocodile of the Nile, “the great Tannin that lieth in the rivers,” is the representative. The confusion of the meaning of the word has been shown by Gesenius to depend on the error of identifying it with a very distinct word, “Tan,” which may mean “the jackall.”

The birds and the reptiles came in together as allied and contemporaneous groups, and the introduction of animal life is, especially in the case of the Tanninim, said to be a creation, a term not used before in the narrative, except in reference to the initial act of the beginning. A whole creative day is devoted to the introduction and growth of invertebrate life of the reptiles and birds, and then, in the last creative æon, the herbivorous and carnivorous mammalia are introduced along with man.

Let us consider what bearing the facts of animal palæontology have in this scheme of animal creation. The *first* and a very startling conclusion that we reach here is, that the fifth and sixth days of the Mosaic record cover nearly the whole of geological time. Of the earlier creative æons geological science knows nothing except by inference. As soon as the work reaches that period

when animal life made its appearance its record begins. All our geological formations back to the Laurentian contain fossils, and the reduction of animal types to fewer and lower forms as we go backward seems to point to the Laurentian period as near the beginning of life on the earth.

A second conclusion, and a point of agreement with geology, is that in both records the general arrangements of inorganic nature were perfected before the introduction of animals. The sea and land had been separated and all the arrangements of the atmosphere and the relations of the earth to the heavenly bodies completed. So in the geological record, the eyes of Silurian trilobites were fitted for the same conditions as those of existing animals of their tribe. The structure of the trees of the coal formation shows that the sap moved, and all the other changes of vegetable life were carried on as at present. Impressions of rain drops occur in some of the earliest rocks, hills, and valleys, swamps and lagoons, rivers, estuaries, coral reefs, and shell beds in the oldest formations—all conspiring to show the fixity, not merely of physical laws, but of the arrangements and correlations of these laws, probably from the beginning of geological time.

*Thirdly.* It is remarkable that both records concur in ascribing the origin and earliest existence of animal life to the sea, where we are told there are “creeping things innumerable.” The sea is even yet the great storehouse of animal life, and it would seem for long geological ages to have been the only theatre of its development. The Hebrews were an inland people, and even the later Jews were not very maritime in their habits; but they had given to them this great cosmical truth which is not without significance. In a physiological point of view it indicates the important fact that the conditions of animal life are easier in the sea than on the land. There both the most minute and the grandest forms of life can find suitable conditions, and there the feebler tissues and the less energetic vitality can succeed in the battle of life. In its geological relations it shows that it was necessary that the land itself, to be suitable to the

support of the higher forms of life, must be born from the sea, and that the action of marine organisms in heaping up beds of their skeletons was one of the necessary preparations for the actual condition of our continents.

*Fourthly.* Both records give us a grand procession of dynasties of life, beginning from the lower forms and culminating in man. This is necessarily more complete in the geological record, so far at least as details are concerned. But the relation is precisely that of a broad, general sketch from the pen of a historian, and the patient search of the antiquary into the buried relics that illustrate that same history. The oldest animal known to geology is the "*Eozoon canadense*," found in the lower Laurentian, the oldest series of rocks known to us. It is a member of the group of Protozoa, very simple, gelatinous animals, as near in their structure to the elementary germinal matter which seems to be the special seat of life in all animals, as it is possible for individual animals to be. The modern representatives of this group inhabit both the ocean and the fresh waters, but it is in the former that they most abound, and it is there that they became clothed with calcareous shells, which have accumulated in the sea to form great limestone beds. The representative of this group in the Laurentian era was of gigantic size, forming great reefs of calcareous rock, after the manner of modern corals, and it seems to have had few if any rivals in the occupancy of those ancient seas.

Leaving the Laurentian age, in the next succeeding, or Primordial, a great and wonderful development of life occurs, and we have now animals belonging not only to the Protozoa, but to the groups of Radiates, Molluscs, and Articulates, no longer merely gelatinous animals, but presenting most complicated parts and organs. The teeming multitudes of these creatures in the Cambrian and succeeding periods are so great that whole beds of limestone are often made up of fragments of their skeletons, and we derive the impression that the seas were as rich in the lower forms of life as they have ever been since. As we ascend in geolo-

gical time, vertebrate life has its commencement, beginning, like the lower forms, in the waters; and it is not until we are approaching the close of the Paleozoic that reptile life is introduced, while reptiles and birds make their appearance in the earlier Mesozoic, in which also reptilian life culminates in the gigantic and multiform Dinosaurs and their allies, of what is *par excellence* the reptilian age. In like manner, the record of creation, after stating the creation of lower forms, goes on to specify the gigantic reptilian animals of the Mesozoic by the term "Tanninim"—the special designation of the crocodiles of the Nile, the greatest reptiles known to the ancient people of Asia, and still to us the highest and greatest reptiles of the earth, and with them the birds, the highest creatures, denizens of air, their contemporaries in geological times. We may note here the still closer agreement when we consider that according to both records gigantic carnivorous reptiles were lords of creation during at least the latter half of the fifth creative æon.

So as we ascend into the next creative æon the mammalia represented in the Mesozoic of geology by only a few small species become dominant; and here we have in the prominence given to the larger Herbivora (the Behem of Genesis) a position corresponding to their grandeur and dominance in the Eocene, while in the introduction of the beasts of the earth, or carnivorous mammalia, we learn that they also take the place of the great reptilian life-destroyers of the Mesozoic. Lastly, in this great progression, man appears, not the product of a separate day, but, in accordance with the revelations of geology, at the close of the same great period in which the mammalia became dominant. And then follows the rest of the Creator, in which man was to carry out first in Eden, and afterward in the whole earth, the will of his Maker in replenishing the earth and subduing it under the rule of his higher intelligence.

The progress in animal life thus shortly sketched is sufficient to show the remarkable manner in which revelation has foreshadowed what in these last days the rocks have opened their mouths to tell.



*Fifthly.* With reference to the precise manner of the introduction of the life or the secondary causes, if any, introducing its various forms, neither record gives any definite information. In the sacred record the term "create" is used in the case of the first animal life and of that of man. The other stages are indicated by a word of less power, "make," and by the expressions, "let the waters bring forth," "let the land bring forth." So in the geological record the waters and the land bring forth successive dynasties of life, which continue for a time, and perish without telling us of how they appear, and giving us no hints as to the causes of their decay and disappearance.

Modern philosophical speculation has endeavoured to press scientific facts into its service with the view of supplying the deficiency in our knowledge, and these speculations have in our time all taken one form, that of derivation, or the descent, with modification, of one species from another. They are based on the order of succession of animals as it appears in geology, which such views would refer not merely to the plan of the Creator, but to a progression of animals under natural laws; and also on the analogy between the development of the individual animal from the embryo, and the progress of animal life in geological time.

These two facts modern theorists divorce from the plan and will of the Almighty, at least in so far as any direct action is concerned, and explain by natural laws which they profess to derive from natural facts. In this way they seek to satisfy the desire of the mind for a cause of things without penetrating to a primary cause on the one hand, or troubling themselves as to final cause in nature. We may descend at once to the lowest depth of these theories by referring to Strauss, who, after labouring for a lifetime to rationalize the Gospels, at length, in his old age, accepted Darwin as the great apostle of a new religion, and was content to believe that all the phenomena of life and spirit were merely physical, and to utter the unhappy confession of unbelief. If we would speak as honest, upright men,

we must acknowledge that we are no longer Christians. It is fair, however, to say here that Strauss, as is natural, goes beyond his teachers, and affirms more than many evolutionists will admit. Still, there can be no doubt that in doing so he merely does what nine-tenths of earnest men will do if they accept his premises. It is easy for shallow men in whom religious feelings have little hold, or who regard religion as merely a thing of sentiment, or a device to tickle the senses and quiet the conscience of the multitude, to say that they can reject Moses without rejecting Christ; but common sense cannot be deceived in this way, and Strauss is merely in this an example of an honest thinker who, having drifted from the belief in revelation, has founded his faith on what in many cases he fancies to be proved results of scientific investigation.

When, for example, Strauss considers it proved, as he does, that physical forces have been shown to be sufficient to account for all that has been referred to life and spirit, he goes altogether beyond anything that scientific discovery has yet revealed. If we reduce a living organism to a single vegetable cell, or to the microscopic grain of jelly-like matter which constitutes one of the simplest animalcules, we have in such a cell, in such animalcule structure, not accounted for by any physical or natural law, or combination of such laws, phenomena of life which stand alone among forces, and have not yet been shown to be caused by either physical or chemical energy. Further, when such an organism dies we have as yet no means of isolating or registering the force which it has lost, and yet all the effects formerly produced by this force have disappeared. Whether ultimately heat and light having been shown to be allied forces or modification of one force, it will be found that any combination of these forces may produce, develop, or be converted into vital force, we cannot say; but that this has not been done, or ever yet shown to be possible, is certain. It is easy, as some physiologists and physicists have done, to assume this, and to ridicule those who believe in vital force; but when we examine their mode of treating the subject,

we find that they give us figures of speech and vague analogies instead of facts. When, for example, Huxley says we might as well attribute the formation of water when hydrogen and oxygen combine to an imaginary principle of aquosity, as the properties of living matter to a great vital force, his own words show that he is merely begging the question at issue. He says, "If the nature and properties of water may properly be said to result from the nature and disposition of its component molecules, I can find no intelligible ground for refusing to say that the properties of protoplasm result from the nature and properties of its molecules." Now if protoplasm here be meant to indicate living protoplasm, the whole matter to be proved is taken for granted. If protoplasm be here taken to mean dead albumen, regarded merely as a chemical compound, then the statement has nothing whatever to do with the subject in hand, and it is so far inaccurate that even dead protoplasm has not yet been produced by mere physical or chemical means; but taking the two substances at precisely the same value as chemical compounds, the denial that some new force has actuated the protoplasm when it assumes the varied functions of life is as unreasonable as the denial that some new force has taken hold of the water when it ascends into the branches of a tree. Whatever is the nature of the force, and however dissimilar in the two cases, it is unquestionably superadded to merely chemical forces combining the atoms of a compound.

Or take such a statement as that made by Tyndall in a book extensively used as a text-book, that the molecular forces determine the form which the solar energy shall assume. "In the one case this energy is so conditioned by its atomic machinery as to result in the formation of a cabbage; in another case it is so conditioned as to result in the formation of an oak. So also as regards the reunion of carbon and oxygen—the form of this reunion is determined by the molecular machinery through which the combining force acts; in the one case the action may result in the formation of a man,

while in the other it may result in the formation of a grasshopper."

This statement is so absolutely without foundation in fact, and so full of errors, that one scarcely knows where to begin to criticise it. In the first place, though a cabbage could not grow without solar energy, any more than it could grow without water or potash or many other things, it cannot be in any sense called a form of solar energy, neither have we any evidence that solar energy, acting for ever, could produce a cabbage, without a previous cabbage seed. Nor is it true that the difference between a cabbage and an oak is merely a difference in form of solar energy, unless, indeed, we assume that the germ of the cabbage and of the oak, with all their diverse vital powers, have also been created by this same solar energy. But in this case we should have to assume that the omnipotent solar energy, even when unconditioned by any machinery whatever, could produce these diverse forms and structures. Further, it is untrue that either a man or a grasshopper can be produced by a reunion of carbon and oxygen, or that any reunion of elements could have such effect without the previous existence of men and grasshoppers. Further, the solar energy has less to do with the grasshopper than with the cabbage, since its direct action on the grasshopper is merely concerned in producing its vegetable pabulum. But it is useless to criticise such random statements any further than to say that when men like Strauss are so deluded as to accept as science such statements, we need not wonder at them falling into any amount of error. It is the more necessary when such statements—examples, by the way, of a low and sensational style of science-teaching too common in our time—pass current with the multitude, that educated men should have such general teaching in science as may place them beyond the reach of its influence. It is also apparent here that the statements of Genesis as to creation, while not contrary to the facts of science, are fitted to control and check superstition on the one hand, and baseless speculation on the other.

But life being once introduced in some of its lower forms, whether animal or vegetable,

is it necessary to affirm in addition that animals and plants were created after their species? May we not be content to suppose that lower forms of life were gradually changed into higher, and that thus the earth was peopled in its successive ages? Now, in so far as theology is concerned, this may be a matter of little consequence, so long as we limit our attention to the lower animals; but when we arrive at man the case is very different, and the course followed by the advocates of such views is to bring first before us the case of the lower animals, and the lowest among them, and having familiarized us with the idea of descent, with modification in their case, to ascend to man, and show that the same law applies to him not only in his material nature, but in whatever of higher powers and sentiments there may be in him. Darwin, the great apostle in our day of these views, does not seem to have gone so far as absolutely to identify the physical and the vital in the way that Huxley, Tyndall, and others have done. He seems to require that some living forms, however few and simple, shall be given to him to begin with. It is clear, however, that there is a certain inconsistency in this, since if the act of creation has even been once performed, there is no good reason to deny that it may have been repeated. In a philosophy of this kind, however, some first point must be reached where the premises must be assumed, and it is perhaps as well to stop at the great gap between the living and the non-living as anywhere else, and that is where Darwin has found it convenient to stop. Granting, then, as material for the process, a few of the more ancient and lower forms of life—as, for example, the old eozoon of the Laurentian, or a few molluscs and crustaceans of the Primordial—have we any evidence that out of these the remainder of the animal kingdom has been evolved? I take the animal kingdom because in it the record is more varied and complete. Now, a difficulty meets us here at the outset, with reference to the precise nature of the question with which we have to do. It is that as to the distinction between species and varieties. Species of animals are supposed to be separated from

each other by well marked lines of difference, and they have not the power of so intermixing with each other as to produce continuously fertile progeny. They stand thus as units in our systems of natural history classification. But species are more or less variable under the influence of external conditions, and the varieties so formed may or may not be true species. I say may not, for though I believe that they are not, the derivationist tries to break down the line between species and varieties. It results from this that there may be different views as to the limits of species. Man himself has, for example, been broken down into different species, while by most naturalists the diversities of men are represented as of the nature of races and varieties. The best British naturalists of our day have usually held to large specific aggregates. The continental naturalists, like the late Agassiz and his disciples in America, have been in the habit of naming as a distinct species every slightly different form. This is still an unsettled point, though I think the error has been rather in making too many species than too few—the prejudices and interests of observers tending that way. It is plain, however, that if we hold that species were created separately, and if out of one group of animals one naturalist makes ten species and another three, we are not bound to claim the ten species as separate creations, unless we regard them as well founded.

There is another caution to be noticed on the theological side. The verbal precision of the first chapter of Genesis must strike every candid student; yet the writer uses different formulæ for the introduction of different grades of being. "Let the earth bring forth," is the formula for plants. "Let the waters bring forth," is the formula for the lower animals. God "created" the great Tanninim; so the earth "brought forth" the mammalia, and God "made" or formed them; but man he "created." We can see distinctly, by a comparison of the use of these expressions in the record itself and in other parts of Scripture, that they are not used at random, and that they have different degrees of signification, but what these are we do not as yet precisely

know. Had I time to enter on the subject I could, however, show you a certain palæontological appropriateness in them which we are beginning to perceive, and further, they imply that each step of the creative work was used by the Creator in some way to further each new advance. In the meantime we may regard them as intimating that Moses does not himself adhere to one mode of creation for all animals and plants. He intimates that they were created at different times, which geology has since amply confirmed; and he intimates also that there were different modes of operation of the divine power in their introduction, a fact which is perhaps less clear to us because as yet we have been struggling to prove that all animals were introduced in one way or another to the exclusion of the rest, while some have been striving to dispense with the creation altogether, and some to reduce God to an arbitrary mode of working, and not admit that creation may have been according to plan.

These preliminaries being settled, we come to the question, what evidence have we that the animals now on the earth, or any considerable part of them, have been derived from preceding creatures of different species? The direct evidence might be of two kinds. First, we might be able to show that the species have so varied as to pass over into new specific types. Secondly, we might be able to show that ancient and now extinct species have given birth to those that now exist. If either of these two things could be proved, we should then have positive evidence of derivation.

The first kind of proof has been attempted, with vast industry and consummate ability, by Darwin, and the result has been confessedly to show that on this line direct evidence cannot be obtained. In some species—as in the pigeon, for example—marvellous variability can be found; but then, as Darwin himself has shown, all these extreme varieties are still pigeons, capable of breeding into each other, and even of returning, by cross-breeding, into the wild stock from which they sprang. While, therefore, by selection, a vast range of variety can be secured, it seems all to fall

within the limits of the species, and to be incapable of breaking down the barrier between this species and even those most nearly allied. This Darwin admits; but he claims that he has established a presumption that, longer time and greater isolation and varieties of condition being given, the specific limits might be overstepped; but this is all, and even this presumption seems to become less tenable as the facts are more carefully studied. He has shown, however, that we should be cautious in our classification, lest we confound varieties with species.

The laws referred to by Darwin, as concerned in the work of derivation, are thus stated by Wallace, in a summary of the hypothesis maintained by the former:—

1. The law of multiplication of animals in geometrical proportion. By this any animal, if unchecked, would soon fill the world with its progeny. The checks are supplied by the destruction of germs and of adults by enemies, by limitation of geographical range, by limitation of particular kinds of food, and by other causes.

2. The law of limited population, whereby the habitable area afforded by the earth has always been stocked with inhabitants; so that the introduction of any new form of life must involve the extinction of others, and the spread of any one beyond its former limits must involve the limitation of others; while the germs produced by every kind of animal and plant must, in the great majority of cases, fail to find space for their development. Hence arises a constant struggle for existence.

3. The law of heredity, by which the progeny of all animals resemble their parents in all essential points, though differing in individual details; and whereby, also, individual peculiarities acquired by the parent may be transmitted to its offspring.

4. The law of variation, by which such differences, under the influence of external conditions, accumulate until they give rise to distinct variations in form or races, as we observe to be the case in so marked a way in our domesticated animals, but not so great an extent in wild animals. This is the reason why we can domesticate some and not others.

5. The law of change of physical conditions, whereby certain areas of the surface of the earth become different at one time from what they were at another, in the conditions necessary to life. Thus we know that in the Miocene tertiary period the climate of Greenland and Spitsbergen was so mild that plants like those of the Middle States could flourish in those now inhospitable regions. On the other hand, in the Post-pliocene time an Arctic climate extended further south than at present over our continents and seas. We know, also, that nearly all parts of our continents have been many times submerged for long periods, and re-elevated to a higher position than now.

6. The law of the equilibrium of nature, whereby individual varieties and species well adapted to their environment flourish, while those less perfectly adapted decay; and as, according to the previous laws, the conditions are constantly changing, the struggle for existence constantly goes on, and the animals being liable to vary and perpetuate varieties, there must, of necessity, be a gradual change in the animal population of the earth: that is, those which change so as to become suitable to the changed conditions live, and those which become unsuitable die.

Stated in this way, you can easily see that the Darwinian theory has a very plausible aspect; and it is to this that Mill refers when he says that, when investigated in detail, it is not so absurd as it appears at first sight.

You will observe, however, that these laws do not touch the actual origin of living things; they presuppose species and suitable conditions of life. Further, if there should be any way in which new species may be introduced, then these laws may be limited in their application to the variation of species within certain limits, and to their extinction when the conditions become unfavourable too rapidly, or to too great an extent. The only conflict between the application of these laws and the Scripture is when they are applied to the origin of things, or when they are employed to dispense with the action of the Divine power by which, on the theory

of Theism, these very arrangements were introduced into nature. They further come into conflict with revelation when they represent man with all his higher powers as a mere outgrowth of the variation of brute animals. But for these applications of it, the Darwinian hypothesis would be a harmless toy for philosophical biologists to play with until they can obtain some basis of fact on which to explain the origin of species.

These aggressive applications of the doctrine of Darwin are, however, constantly made, and are paraded by a host of litterateurs and third-rate scientific men as if they were sufficient to explain all things, and to relieve us at once from the necessity of the Scriptures and of God.

The second line of argument—that derived from Palæontology—might be expected to furnish in fossils connecting links between extinct and recent species. On the contrary, however, it shows a marvellous persistency of species through vast periods of geological time, and often under diverse varietal forms passing into each other; but each species seems to come in without progenitors, and to become extinct without descendants. It is true that the geological record is very imperfect, and that connecting links may be lost; but the want of them in the vast number of cases of appearance of new species, and this in those formations in which fossils most abound, takes away the greater part of the force of this consideration.

The obvious fact that there has been a gradual increase in variety and elevation of living beings from the earlier periods until now is often adduced as an evidence of derivation, but is equally explicable on the supposition of a creative plan.

The nearest approach to direct palæontological evidence is that which has been adduced by Huxley in England, and Marsh in America, as to the relations of the modern and tertiary horses to some similar animals, their predecessors, in the middle and early tertiary periods. This shows, undoubtedly, the introduction at successive periods between the beginning of the Eocene tertiary and the modern animals more and more approximating to the modern

horse. But none of these are known to pass into each other by varietal forms, and the supposition that they were produced by a passage from one to the other, even if this were granted as possible, requires, when striving to realize it, such a complicated combination of changes in the animals themselves and in their surroundings that it becomes simply incredible, except on the supposition of intentional intervention.

In so far, then, as either the origin of species or the origin of man is concerned, the Darwinian theory is not entitled to rank as a result of scientific induction. It rests merely on analogy, and on its power to explain easily a great variety of phenomena, provided its premises are granted. In this it contrasts in a scientific point of view unfavourably with the old argument of design, which undoubtedly rests on an inductive basis. On the whole, then, we may be satisfied that Scripture in its detail as to the origin of animals contradicts no received result of science, and anticipates many of its discoveries. I would that I had time to refer to the many beautiful references to the animal kingdom in the Scriptures. A volume only would suffice to comment on the multitude of ways in which, with inimitable truth and beauty, the animal kingdom is made to teach us spiritual things.

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#### ANTIQUITY OF THE HUMAN RACE.

##### THE ORIGIN AND EARLY HISTORY OF MAN.

WHAT is sometimes in our day termed the Science of Anthropology is a strangely mixed subject, compounded of archæology, physiology, and psychology, and touching at almost every point on geology and sacred history, though pursued by its many followers in a spirit both dashing and independent. As I may take it for granted that my readers are well acquainted with what Scripture teaches of the early history of man, I may on this subject proceed at once to notice what we learn of it from archæology and geology. We have already seen that geology presents an ascending pro-

gression of life, and in passing upward in the scale of the geological ages we are for a long series of these ages like travellers exploring some desert isle where new and strange animals meet us at every step, but where we see no trace of man. It is only after the magnificent culmination of mammalian life in the middle tertiary period, and its decadence on the approach of the cold of the glacial or post-pliocene, and the renewal of the world in the post-glacial or modern period, that we can look for man with any hope of success. In the later miocene and pliocene ages, our continents had attained to their full development. Under the mild climatic conditions of these times they were clothed with a luxuriant flora; and the numbers and wide distribution of the higher and larger forms of mammalian life were greater and more complete than at any previous or subsequent period. But it would seem that man was not destined to appear in this age of the world, so noble in all other respects.

At the end of the pliocene began the great age of the Arctic cold. The land, by gradual subsidence, began to lose its fair proportions; the seas became invaded by northern ice; snows began to settle permanently on the hill-tops; and glaciers to plough their way toward the sea. The world, after all its changes, seemed about to fall into ruin, and multitudes of species of animals and plants either perished or were driven to those southern portions of the continents which still remained habitable. But this great change was only a long winter, during which the ploughshare of God was to prepare the world for a new spring. So the land rose again, and its warm climate was partially restored, great rains and melting snow remodelling its features of valley and plain. At length the northern continents became again more extensive than they are now. England and Ireland, for example, were joined to the continent of Europe, and a great but nameless river flowing through the valley which is now the English Channel received the streams of Northern France, England, and Germany. The American land also stretched further into the Atlantic than it does now.

In this, the post-glacial period of geology, the land again became tenanted by animals, some of them survivors of the pliocene age, some of them new; and it is to this time that many geological facts tend to assign the first appearance of man in Europe and Western Asia. If so, he was then contemporary with many great mammals now extinct, or which have become much limited in geographical range. According to Pictet ninety-eight mammals are known by their remains to have inhabited Europe at this time. Of these fifty-seven still survive, and no new ones have been added except man, the sheep, the dog, and a few others which may have come in with man. In Britain, Dawkins estimates fifty-three species in all of post-glacial mammals. Of these, twelve are survivors of the pliocene, forty-one are new, twenty-eight survive as modern inhabitants of Britain, fourteen have become wholly extinct, eleven are locally extinct or are now known only in other parts of the world. It would thus seem that man entered Europe at a time when its mammalian forms were richer than now, and when it was a densely-wooded region into which he straggled from his Edenic centre of creation, with a few of the animals connected with him there. If so, he was not destined to remain long undisturbed, for another great subsidence seems to have occurred, connected, apparently with the extinction from Europe of many kinds of animals, and closing the time of what may be called Palæocosmic, or, if we take a biblical mode of expression, antediluvian man, and reducing eventually the European land to its present proportions, and introducing a new race allied to the Basques and Lapps, to be followed by the Celts and Teutons and other historic nations, and who may be named the Neocosmic peoples. To this Neocosmic age belong the remains found in the Swiss lake habitations and the shell-heaps of Denmark.

European antiquaries have called the most ancient of these races Palæolithic men, and the more modern Neolithic, under the impression that the earlier race used only rudely formed instruments of stone, while the latter could fashion better stone implements; but American analogies and many

European facts teach us that these indications from implements may be very fallacious. The stone age altogether began to close when, toward the commencement of the historic period, Carthaginian trade extended to the tin deposits of England, and enabled bronze to be a common material for weapons and implements. The earlier or Palæocosmic age has also been termed the Mammoth age, because that great elephantine animal is believed to have still survived, and the later stone age, or the Neocosmic, has, in its earlier part at least, received the name of the Reindeer age, because of the abundance of remains of this animal found in deposits of the time.

As an illustration of the evidence of these ages, I may refer to the caves near Liege, in Belgium, explored by Schmerling, Dupont, and others. Some of these have a lower stratum of mud or gravel, containing bones of the mammoth and other extinct animals mixed with human bones belonging to a large and well-developed race of men. Over this are, in some cases, to be found interments of a smaller race like the modern Laplanders, who seem to have succeeded the first race, and with whom are remains indicating that the animals of Europe were similar to those now living there, except that some forms, as the reindeer, now locally extinct, were present.

The two main points with reference to these races of men, embraced in our present subject, are their antiquity and their relation to modern races. With regard to the first question, as these men are pre-historic we have only geological evidence; and this resolves itself into the calculation of the rate of erosion of river valleys, of deposition of gravels and cave-earths, and of formation of stalagmite crusts, all of which are so variable and uncertain that, though it may be said that an impression of great antiquity beyond the time of received history has been left on the minds of geologists, yet no absolute antiquity has been proved, and the oldest of these remains may, after all, not exceed our traditional six thousand years. In regard to America more especially, we may be said to have no good evidence of any great quantity for man. With reference to the

erosion of river valleys in Western Europe, it can be shown that this probably belongs to a much earlier period than that of man, and that old valleys filled with debris during the glacial period could be scoured out in no great lapse of time. With reference to the growth of stalagmite in caves, recent observations show that this may be much more rapid than has been supposed. With reference to the elevations and subsidences which have occurred, we have no measure of time to apply to them. With regard to the extinction of animals, we know that the reindeer and the aurochs existed in Europe up to the time of the Romans, and the great Irish deer up to the time of modern peat bogs; and we have no good evidence that the mammoth and cave bear and woolly rhinoceros may not have lived up to the time of the historical deluge.

One fact adverse to the high antiquity which has been demanded is the small number of individual skeletons found in Europe, compared with those of contemporary animals, which either implies a short time of residence, or an extremely sparse population. When we come to the second question, that of their relations to modern men, we find no reason to refer them to any very low type; and we have, fortunately, now obtained good material for comparison, in so far as skulls and skeletons are concerned. The skeleton found by Dr. Riviere in the Cave of Mentone in Southern France, and now well known by means of his excellent descriptions and photographs, is that of a man of large stature and great muscular power, with no simian characters, and with a countenance Mongolian or Turanian in type, but otherwise entirely human, while the brain was of large dimensions. The man had been buried clad in a robe of skins, with a head-dress ornamented with shells and teeth of deer. A bone bodkin and flint implements were found near him, and a quantity of red oxide of iron, no doubt his "war paint."

Of the same type are the skulls and bones found in the Cave of Cro-Magnon and other caves in France, and the Engis skull from Belgium, all of which are referred to the mammoth age. They all represent a race of grand physical development, and of cranial

capacity equal to that of the average modern European, while the implements found with some of them show a state of the arts similar to that of the ruder tribes of American Indians, and similar customs of burial, and probably a similar system of tribal and family tokens, and of worship of Manitous or subordinate divinities. They are thus not merely men, but men corresponding to the Turanian and American type, one of the most widely spread and ancient of the races still existing. If antediluvian men, they thus show that these did not differ even varietiesly from modern men, though of greater than average physical power, a property quite consistent with their existence in the dawn of the human period, and at a time when man inhabited larger continents than the present, and had to contend with more formidable animals. If their antiquity be conceded, they really take away all semblance of probability from the doctrine of the origin of man by derivation.

If now we compare these facts with the biblical history of man, we find certain remarkable coincidences.

1. As in the Bible record man is introduced in the same creative æon with the higher brute animals, so in geology he is united without any break to the close of the tertiary period of the great mammals.

2. As God is said to have prepared a place for man, so we find that his appearance is preceded by the close of the glacial period, and by the removal out of his way of many forms of animal life.

3. In both records man is geologically modern, coming at the close of the great procession of animal life; and it is remarkable that geology concurs with revelation in not finding any new species introduced since the creation of man, and only a few species can be supposed to have been introduced along with him.

4. The oldest men whose remains have been found are not of a different species from modern men, but, on the contrary, are nearly allied to the most widely distributed modern race, while their great stature and physical power remind us of the Nephelim or giants of Genesis.

5. The cranial capacity of these earliest



men shows that they were as much lords of creation and as little allied to brutes as their successors are. Further, when we place this fact in relation with the statement made by Haeckel, that, according to the latest views of derivation, lemurs or monkey-like animals of low type in the eocene, passed into apes in the miocene, and these into men in the post-pliocene, the contradiction between this and the high type of the prehistoric skulls seems absolute, especially when we consider the unchanged characters of the Turanian race from the Palæocosmic age to the present day.

6. The condition, habits, and structure of Palæocosmic men correspond with the idea that they may be rude and barbarous offshoots of more cultivated tribes, and therefore realize, as much as such remains can do, the Bible history of the fall and dispersion of antediluvian men.

7. Their funeral rites and the traces of their religious beliefs point to a similarity with those of the most ancient races of men, which are all fairly traceable to corruptions of those primitive articles of faith revealed in the earlier part of the Hebrew Scriptures. Into this I cannot enter here, but may have occasion to refer to it in the concluding lecture of this course.

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#### THE CONFLICT OF TO-DAY.

A REVIEW OF SCEPTICAL SCHOOLS OF THOUGHT  
—MILL'S IDEAS ON RELIGION—A REPLY TO  
PROF. TYNDALL'S ADDRESS AT BELFAST.

I PROPOSE in this concluding lecture to notice some of the errors and partial truths that are more or less current respecting our subject, and to inquire whether they are false or defective, and how they are to be treated. I may take as a motto a remarkable saying of our Lord to the Sadducees of his day: "Ye do err, not knowing the Scriptures, nor the power of God." Jesus was always more tender with the Sadducees than with the Pharisees. He evidently regarded an honest sceptic as more respectable than a ritualist; and even a little science as a better thing than a mere round of hypocritical performances; and this

tenderness is apparent in the mild rebuke which I have quoted, and which I think will characterize the scientific infidelity of our day. Men err in judgment from not knowing the Scriptures, and so attribute to them doctrines which are really not those of the Bible. They err from not knowing, or rather not having distinct conceptions of, the being and power of God. Their want of knowledge may proceed from inadvertence, or from want of opportunity, or perhaps from a natural dislike to higher truth, or an incapacity to perceive it. Much, however, of their error is due, I fear, to the imperfect presentation of truth by those who know it, and to the false glosses and bad morals of the Pharisees.

It is further to be observed that a large part of the opposition to religion attributed to science really proceeds from a philosophy which has little connection with science, and what I would therefore mention merely in its relation to the views of scientific men. The philosophies of Herbert Spencer and of John Stuart Mill, for example, though diverse from each other, lie at the foundation of much of this, as it appears in England and in America. Neither of these philosophies is in accordance with science any more than with the Bible. Both philosophies agree in relegating God to the domain of the unknowable, or at least of the unknown, though in different ways; but in so far as they are related to science, they proceed from this point in very different paths. Spencer takes a constructive method, and, assuming matter and forces, proceeds by skilful use of analogy to assure us that these can successively produce all forms of being. But this constructive method is the very opposite of that of true science, however it may be supported by illustrations taken from scientific facts. It postulates in the first place certain self-existing forces and atoms of matter, or both, endowed with certain powers, and, instead of diminishing the mystery of existence, forces it back and concentrates it on these atoms or forces which, if not produced by an intelligent Creator, are far more wonderful and inexplicable than the arrangements for which they are supposed to account. Its argu-

ment, after the assumption of the almost omnipotent resources claimed for matter and force is, after all, merely an argument of analogy, and not of the inductive character required in science.

Mill, on the contrary, in holding that all knowledge is only relative and phenomenal, and that it is merely invariable sequence, cuts at the roots of our belief, both in matter and force, and really, by his analysis, throws doubt on all that science would regard as the essence of things, and leaves us as destitute of a basis for our knowledge of nature as for our knowledge of God. It is, however, only just to say that in his essay on Theism—his latest work, published only after his death—he bears what, from his point of view, must be considered a most remarkable testimony to the power and the word of God. Discarding as valueless the *a priori* argument for the existence of God, he regards as the only valid argument that from design; and shows that this is really an inductive argument, and is of no mean force when considered in the case of the more complex animal structures, as for instance the eye, to which he specially refers as indicating design. As already observed, in preferring the argument from design, he closely agrees with Scripture, which uses that argument alone in those passages in which it reasons on the subject, as for example in the concluding chapters of Job, and in the first chapter of Paul's epistle to the Romans. It is certainly a remarkable coincidence that the only way in which Paul thinks the heathen could, without revelation, attain to the knowledge of God, is precisely that which the sceptical English philosopher singles out as the only argument valid to his mind. On the other hand, he regards the principle of the survival of the fittest, as held by evolutionists, as "startling, and *prima facie* improbable," and will only admit that "it is not so absurd as it looks, and that the analogies which have been discovered by experience, favourable to its possibility, far exceed what any one would have supposed beforehand." This is, I think, from his point of view, a fair estimate of the value of evolution as a means of accounting for organic structures and

species; and the value of the analogies, when examined scientifically, is less than Mill imagined. It is true that Mill was, even at the last, so far ignorant of the power of God that he affirms that, in so far as the natural argument goes, it fails to prove omnipotence. He can believe only in a God of limited resources. On this point, however, it is very questionable if the details on which he relies to prove imperfection in nature have any such significance, and in so far as Scripture is concerned he does not take into the account the explanations which it gives. For example (1), the necessary incompleteness of our knowledge of God's plans, for "his thoughts are very deep—his ways are unsearchable;" or (2) the necessary incompleteness of created things, and their incomplete reflection of their Maker; for the works of nature are not in themselves like God, but, on the contrary, in their essence and modes of existence, diverse from him; or (3) the compensations which are in God's power—as, for example, when he overrules physical evil for moral good; or (4) the imperfection arising from the introduction of sin. Mill, however, is in so far right, that the Bible itself declines to give origin or reason for the introduction of evil, and that the clay is rebuked for complaining of the potter; so that we must expect always to be unable to reconcile all the procedure of God with his perfections, and to relegate to the domain of facts what reason cannot explain.

The German Pantheists endeavour to combine these realistic and idealistic philosophies in the conception of a pantheistic, all-prevading Cosmos, neither spiritual nor natural, neither God nor matter nor force, yet including all, and developing all things from itself to return into it again. This, however, though having roots both in theology and philosophy, is an idea foreign to physical and natural science. I mention these theories merely to say that they do not belong specially to my subject any further than they aid in presenting the actual state of mind in which we find scientific men.

Passing to the materialistic science of the time, we may take as an example of this a

production which has excited much attention, not so much on its own account, as the state of the public mind which it indicates or supposes—the recent address of Prof. Tyndall as President of the British Association. In its aspect with reference to Scripture this address ignores altogether the position of the Bible with respect to nature, and neglects to acknowledge the obligations of science to God's Word. Truly stating the low and superstitious conception of nature which led to the Polytheism of antiquity, he gives credit to the atomic philosophy of Democritus and Epictetus for raising men to a higher conception of the unity of nature, and he calls their philosophy science, which it was not in the modern sense of the term. But he omits to state that, long before these Greek philosophers, Moses had established in Palestine the idea of the unity of nature, and that on a basis which has lasted to our own time and overspread the whole civilized world, while the Epicurean philosophy failed to root out the idolatries of Greece, and failed to leave any impress on later ages. Historically, it is a fact that one Paul of Tarsus, a disciple of Moses and Christ, had to preach to the Epicureans of Athens as late as the first century of our era the doctrine of the unity of God, of nature, and of man, and that Athens, standing in the midst of its idols, could only, like Spencer and Mill and Tyndall, bow before an "unknown God," till Christianity had overthrown both Stoicism and Epicureanism. Still more unfairly, Tyndall, while thus leaving out of sight the cosmogony of Scripture, attributes to the Bible and to Christ those bigotries of the middle ages which were due to ignorance of the Bible and anti-Christian superstition. Let us hope that he errs, not knowing the Scripture.

Tyndall ascribes science to an impulse whereby, in a process of abstraction from experience, we form physical theories which lie beyond the pale of experience, but which satisfy the desire of the mind to see every natural occurrence resting on a cause. He is willing, however, to gratify this natural desire only so far. He traces back all material things to atoms, having certain definite properties; but as soon as we

venture to ask whence these atoms, and why their properties, he peremptorily says: "Hitherto shalt thou come, and no further." This is his ultimate dogma, without reason or cause. So when we inquire as to force, he is willing that we should correlate forces, assign laws to gravitation, and decide that heat is a "mode of motion," but we must inquire no further. So if we inquire as to consciousness and will and other phenomena of mind, he may tell us that these are functions of brain, but though he quotes Democritus to the effect that mind may be composed of smooth round atoms, he is unwilling that we should satisfy our desire to assign things to causes any further than the anatomist's knife can carry us. There is no more science in this than in the statement of the old physicists that water rises in an empty tube because nature abhors a vacuum.

So in his attempt to advocate evolution on scientific grounds, he says that to believe this dogma fully we must "radically change our notions of matter"—that is, must transfer to matter the powers of mind. He attempts to illustrate the doctrine by the supposed development of the eye. He supposes first a disturbance of chemical processes in the animal organism similar to those which light causes in the plant—a supposition chemically untrue. But granting this, he next supposes pigment cells. The eye, he says, is capable of distinguishing between light and shade, while, contrary to fact, the pigment cells are supposed to be the seat of this sensitiveness. "The adjustment continues," we are told, "and there is a bulging of the epidermis over the pigment cells." Why, we are not told. A lens is now "incipient," and through the "operation of infinite adjustments may reach the perfection of the eye of an eagle." But this is not science. It is only vague speculation, and he well concludes with the remarkable statement: "In fact, the whole process of evolution is the manifestation of a power absolutely unsearchable to the intellect of man. As little in our day as in the days of Job can man by searching find this power." (The quotation is unfortunate, the true translation being: "Canst thou

find out the deep things of God? Canst thou find out the Almighty to perfection? It is high as Heaven; what canst thou do? Deeper than Hades; what canst thou know?") "Considered fundamentally, then, it is by the operation of an insoluble mystery that life on earth is evolved and mind unfolded from perpetual elements in the immeasurable past." We may well apply to Tyndall the latter part of our Saviour's reproof: "You err, not knowing the power of God."

A second phase of apparent antagonism of science to Scripture is that which concerns the organs of life and organization. The doctrine which implies the spontaneous generation of living organisms from dead matter has recently received some apparent support from the bulky volumes of Bastian on the "Beginning of Life;" but the greatest doubts have been thrown upon the validity of his experiments by Sanderson, Huxley, and others, and even a cursory survey of his statements and illustrations leads to the conviction that his work has not been sufficiently careful and accurate to afford trustworthy results. Huxley himself, by his doctrine of protoplasm as a physical basis of life, really dispenses with vitality as a distinct force—or modification of force—as much as Bastian, and would remove all difficulty in supposing the creation of living things without any creative act. Further, in his recent paper on animal automatism, Huxley goes as far as possible, without directly reaching it, toward the conclusion that the animal and even the human organization is a self-regulating machine, requiring no special vital or mental force to secure its actions and results. The doctrine of protoplasm has, however, been thoroughly canvassed by Beale, and the distinction between living, dead, and formed protoplasm clearly defined. Indeed, the position of Huxley here has been illogical from the first, for while attributing to protoplasm, as mere albuminous matter, the properties of life, and ridiculing the idea of a vital force, he was obliged continually to refer to living protoplasm and dead protoplasm as quite distinct in properties, while denying in his hypothesis that any such distinction

could exist. So far, therefore, science can scarcely be said to have given us any definite doctrine as to the origin of life.

It is, however, deserving of notice that the eminent naturalist last mentioned, in the address to the British Association, in which he so strongly dissented from Bastian's conclusions, took occasion to ascribe to the Scriptural writers a belief in spontaneous generation, or at least in transmutation of species, in common, as he said, with many other ancient authorities. His evidence as to this was the reference to the germination of a grain of wheat in illustration of the resurrection. "That which thou sowest, thou sowest not the body that shall be, but a bare grain, it may be, of wheat, or some other grain; but God giveth it a body according as he pleases, and to each kind a seed or body of its own." It seems difficult to see here any kind of doctrine of spontaneous generation, and indeed the whole argument is of the opposite sort. Paul had affirmed that the grain of wheat is not quickened except it die—a vivid way of putting the plain truth that the mass of the seed perishes in favour of the little almost invisible germ of life which it contains, and which springs up as a new body. He next says that God determines the body it shall have, and to every seed its own body according to the kind of seed it may be. There is no room here for heterogenesis, and if it were possible either that something not a seed should produce a new body, or that wheat should produce tares, or tares wheat, the argument would be altogether invalidated, for it is the germ of spiritual life existing in the man here that must grow up, and this according to its kind, as the future completion of spiritual life. Paul, in short, perfectly agrees with Moses, that God created plants according to their species.

Until we can secure a natural beginning of life without the intervention of the Divine power, the question of derivation of one species from another is of secondary importance, and in its Scriptural aspect relates chiefly to the meaning we are to attach to the views of mediate creation given Genesis i., and to the force to be attached to

the expression, "after its kind," relating to the views which natural science may settle as to the limits of species. These points we have already discussed, and also to some extent the more important questions as to the origin of man.

It may be well, however, to notice the manner in which the presumed origin of man from lower animals is followed out by writers of various schools of archæology in their speculations on primitive culture and religion. Tylor, Lubbock, and others in England, and their followers in America, proceed constantly on the assumption that all human culture is to be traced back into a period of pre-historic darkness in which man had scarcely emerged from a brutal condition. In short, they neither admit the Scriptural account of the origin of man and of his religion, nor do they admit the power of God to create a being in his own likeness. These men, ignorant, like the Sadducees, of the Scriptures and of the power of God, claim for their speculations the rank of a science, and deducing all that is noblest in humanity from all that is basest, dispense at once with God and religion, and destroy all the grandest historical traditions of our race. As the student of nature, I confess I have less respect for them than for the mere physicists and physiologists, who at least collect facts and interrogate nature in an earnest and scientific spirit. These men derive all religion from myths, trace back sacrifice and prayer to merely human relations among savages, resolve the belief in immortality into the result of dreams, and the idea of God into a fanciful ascription of "animism" to dead objects. If their conclusions had any scientific value, they would be much more destructive of Scriptural and rational theology than anything arising from physical or natural science can be. They have in them, however, an element of truth which becomes manifest when we compare them with the simple theology of the early chapters of Genesis, and the crude beliefs that have replaced true religion in the minds of the lower and more isolated races of men. Take, for example, the instinct of immortality, which it is admitted is uni-

versal among men. This is quietly attributed to the fact that men dream of their dead friends or enemies, and thus have everywhere come to believe in their continued existence after death. It is evident, however, that this is merely a convenient evasion of a difficult fact. Men in a rude and primitive state dream little. They are much more likely to dream of affairs that concern themselves than of their dead friends, and such dreams are likely to be only occasional and exceptional. Nor is there so close a connection between such dreams and the future life of the dead as to make the belief universal. It is much more likely that the belief proceeds from some cause belonging to the primitive state of man, and perhaps coeval with his origin. The Bible gives us a more logical solution. Man was originally immortal, and it was a part of his nature to cherish the hope of an undying life. When he lost the gift of immortality he had a hope held out to him of its restoration, and this hope necessarily lies at the foundation of all the religions of humanity, and is the last part of religion which remains in the midst of its corruption and decay. Wherever we find this belief, under however corrupt and degenerate forms, we should respect it as a relic of primitive faith—nay, more, as a primitive instinct or intuition depending on the original immortality of man—and should not, with the sceptic, relegate it to the domain of mere myth and fancy. Christian writers have often been false to the Bible and to the cause of truth in the treatment of such old beliefs. Let us sift from the error with which they are mixed, and retain, the golden grains of truth.

Sceptical writers of this school often make another strange mistake in denying the existence of the doctrine of a future state in the Old Testament. Now it is true that this doctrine is little insisted on there, because it was an instinct already implanted in men's minds, and because it had been made bad use of by priests, who pretended by their rites and ceremonies to give bad men a passport into future happiness. The prophets of the Old Testament insisted more on a holy life in this world, and on the

doctrine of the present and immediate chastisement of God's people for their sins—a doctrine also of the New Testament—and perhaps to be more inculcated than it now is. But the promise of salvation made to Adam, the promise to Abraham, the Messianic doctrine, and a hundred incidental references show, as our Saviour said, that he God of the Old Testament “is not the God of the dead, but of the living.” If life and immortality are said to be brought to light by Christ, this is not that they are initiated, but more clearly and plainly made known.

The offences of this school of writers against truth are countless. I have time to refer to only another. Primitive man, destitute of any knowledge of God, feels for him in nature. Paul argues that human reason, so seeking for God, can discover his power and his Divinity, and maintains that the true God is not far from every one of us. The modern school of archæology maintains that man first deifies and personifies all objects around him, and only by slow and painful steps attains to Polytheism or Pantheism, and in a higher stage of culture reaches to imaginations and sentiments respecting a supreme God, while at a still higher stage he comes, with Spencer and Mill, to find that he was mistaken, and that after all no such being can be found or known. This also is wholly conjecture. Perhaps there is a historical basis for Monotheism, as well as for a future state. How does it stand in the Bible? Have any of us ever endeavoured to realize the theology of Adam, and what it would be to hear the voice of God in the evening breeze in the trees of Eden, and to learn from that and our own consciousness his nature and unity? Or if we cannot clearly believe this, let us add to it those strange words, that sound like an echo from Eden, which Paul spoke in the Acropolis of Athens—that they should seek God if haply they might feel after him and find him, though he be not far from any one of us, for in him we live, and move, and have our being. Let us suppose this to be the sum total of our theology, and then think how easily out of this the mind of humanity might develop in

the course of the ages all the varieties of belief that have ever existed in the world; every one of them containing this theology with various additions and under different features.

Or let us suppose that we possess in a traditional form the story of creation and of the fall, and this alone. Let us think of the plural Elohim with attributes of unity, and creating by his vivifying breath a spirit and by his almighty word; of the golden age of Eden; of the fall and the promised Saviour, the coming one, the Jehovah. Now let us go forth with this as our sole treasure of Divine knowledge, and idealise it into a triple God, and deify the God-given woman, the first mother, as an Astarte, an Isis, an Artemis, or Atahensic, and worship as the coming saviour every great hero and benefactor, whether a Vishnu or Osiris, a Hercules or Apollo, or an American Yoskeka. Here we have again the germ of the more complex religions. Moses has given us in the old Bible story, and purposely, no doubt, the germ of the whole. Why cannot we preach this to modern heathens and modern sceptics as Paul did at Athens? I have touched on these points to show you a Biblical method of dealing with the pseudo-science of the evolutionist archæology which has grown up in our day, especially in Germany and England, and which, from the interest that attaches to its vast agglomerations of facts and fancies, is pervading all our literature.

It is a relief to turn from these writers to men like Max Muller and Kingsley, who, though feeble-kneed in orthology, and amenable to some extent to the charge of not well knowing the Scriptures and the power of God, have at least some regard for the religious belief of mankind, and are not tied to the car of the evolutionary Juggernaut which is crushing the brain and heart alike of science and theology.

Max Muller in his lectures on the Science of Religion, and Kingsley in his pleasant if superfine lectures on Superstition and Science, have given us some thoughts suggestive beyond the application they make of them, with a reference to which I may fitly close these lectures.

Muller, in attempting to classify religions, objects to the distinction of natural from revealed religions, on the ground that no religion is purely natural, and that revealed religion should include the elements of what is natural. He further objects that revealed religion would be taken to include only the religion of the Bible, while all other religions would be relegated to the dawn of natural religion. Muller's conclusion here is in perfect harmony with the teachings of the Bible, but his reason for arriving at it shows that he does not fully apprehend the matter in question. Natural religion, in the view of the Bible, would include all that appertains to the original image of God in man, and all the knowledge of the power and divinity of God which man can learn from nature. This should and does more or less exist in every religion whatever, and, on many of these points, as we have already seen, heathen religions occupy common ground with the Bible. On the other hand, Divine revelation to man gives him those higher spiritual truths which he cannot learn from himself; and since, according to the Bible, such revelation began in the time of the first man, and was continued more or less in all the generations of men, this also must enter in some degree into every form of religion. The elements of natural and revealed religion are therefore to be found side by side everywhere, and it is for this reason that no religion is wholly natural or wholly revealed, and that no religion is wholly false.

The classification which Muller adopts of religion into three great groups corresponding to the three great groups of languages—the Turanian, the Aryan, and the Semitic—is more in accordance, so far as it goes, with Bible history than he seems to be aware. The Turanian religions are universally regarded as the most simple and primitive, and they still exist in full force among the ruder American and North Asiatic tribes, and in more refined form in the oldest religion of China. What are these religions? They include a belief in immortality often developed into a worship of ancestors, a recognition of a God in nature, sometimes as a Great Spirit and Creator, often with a gene-

rally diffused deification of nature. These elements lie at the basis of the Aryan and Semitic religions as well. What are they all but more or less disintegrated remnants of that primitive faith in God and an immortal life which we find in the early chapters of Genesis—a more or less corrupt survival of antediluvian and patriarchal religion? The religion of the Aryan races, as we have it in the ancient mythologies of India and Greece, must have sprung from a faith akin to that of the Turanians, but further developed. It begins with the idea of a Heaven-father, or nature God, Dyauspitar, Zeus-pater or Jupiter, whose name Muller compares with the Christian invocation, "Our Father in Heaven," and whose attributes are distinctly related to some of those of the true God. It goes on to add to this various mediatorial and sacrificial ideas connected with a series of principal gods and deified heroes, amalgamated with old nature gods or manitous. It is, in short, aboriginal theism run wild into a labyrinth of subordinate mediators and intercessors, and divorced by a corrupt anthropomorphism from the higher moral aspects of religion.

The Semitic religions, if we except that of the Jews, followed a similar course of development, except that they clung closer to monotheism, and to the human rather than the physical elements of religion. Hence a higher and grander character even in the Semitic heathenism. The relation of this to the Hebrew monotheism is very close, even in the name of God—El, or Eloah, or Elohim, being prevalent throughout. Thus in the matter of religion the Hebrew Scriptures combine the elements of the whole, and though they denounce the corruptions by which heathens worshipped the creature rather than the Creator, they are willing to acknowledge the remnants of truth which corrupt religions contain, as we find in Paul's speech at Athens, and in his Epistle to the Romans.

What I mean may perhaps be illustrated by a familiar example. One of the earliest and most widespread idolatries is the worship of a female deity—Ishtar, Astarte, or Isis—mother of men, or of a Saviour hero, or of both. The root of this must have been in a tradition similar to our story of Eve and of

the fall, and not, as often alleged, in a deification of the moon or of night. The naturalness of the idea is seen in the widespread modern adoration of the Virgin Mary as the mother of God, which has precisely the same relation to the Gospel story of the nativity that the older worship bears to the story of the fall; and just as the older female deities were associated in their worship with Heaven and the heavenly bodies, with seasons of the year and with sacred places, so is the more modern goddess, and, but for the historical facts, it would be quite easy to reduce the Virgin Queen of Heaven to a nature myth. Even those who reject all historical basis for the ancient idolatries, and who ridicule what they are pleased to term Euhemerism, cannot deny the historical basis of the adoration of the Virgin, or fail to see the analogy which it presents to the worships derived according to the Bible from the story of Eve.

I have endeavoured to show that the so-called science of religion, in so far as there is any true science in it, really brings us back to the religion of the Bible, because there seems room to fear that in these times of atheistic literature, such loose and partial, and at the same time attractive, views as those of Muller may gain a currency to which they are not entitled, unless with such qualifications and explanations as those above suggested.

An interesting view of the relations of science to superstition on the one hand, and religion on the other, may be obtained from the lectures of Canon Kingsley above referred to. He defines superstition to be an unreasoning fear of the unknown, and very cleverly traces the steps by which ignorant and barbarous peoples may come to dread the supposed demons of the storm, the rapid, or the landslip, and to attach superstitious reverence to animals and plants. No doubt this is a large and fertile source, if not the principal source, of superstition; and this accords with what we have already seen of the use of the early chapters of Genesis in offering such tendencies. He shows how superstition may be remedied by a better knowledge of natural laws derived from science, and no doubt there is much truth in this, since so soon as men learn that natural

processes depend on invariable and ascertainable laws, they learn also to hope for mastery of nature, and cease to dread the evils which they can avert. He fails, however, to observe that there are many natural sources of pain and evil which no science however perfect, has hitherto succeeded in overcoming, and that a boundless extent of the dreaded unknown must ever surround the little circle of light in which science enables us to stand. This can only be finally overcome by the conviction that the unknown is in the hand of a God who is our father and cares for us. This revelation of God to man must ever encircle with its infinite embrace the barren domain of science.

In his lecture on science he contrasts the fear of the superstitious with the boldness of the man who interrogates nature and seeks to pry into her secrets. He singles out the races and men who have thus boldly asserted the mastery of man over nature, and justly gives the first place to the "Old Jews." Sketching the superstitions of Egypt and Canaan, from which they emerged, he says there were among them a few men—sages, prophets—who denounced superstition and the dread of nature as the parent of all manner of vice and misery, who said that they discovered in the universe an order, a unity, a permanence of law, which gave them courage instead of fear. They found delight and not dread in the thought that the universe obeyed a law which could not be broken; that all things continued to that day according to a certain ordinance. They took a view of nature totally new in that age—healthy, human, cheerful, loving, trustful, and yet reverent—identical with that which is beginning to prevail in our own day. They defied these volcanic and meteoric phenomena to which their countrymen were slaying their children in the clefts of the rocks, and, like Theophrastus's Superstitious Man, pouring their drink-offerings to the smooth stones of the valley, "and declared they would not fear, though the earth was moved, and though the hills were carried into the midst of the sea." He adds that "no nation has succeeded in perpetuating a school of inductive physical science save those whose minds have been saturated with



these same views of nature which they have—as an historic fact—slowly but thoroughly learnt from the historical writings of the Jewish sages.”

We have already seen how true all this is; but it suggests two questions to which Kingsley does not refer, in deference, perhaps, to the unbelief of a portion of his Royal Institution audience. Of what use would such courage and conviction be if there were not a paternal God beyond the volcano, the earthquake, and the storm, who could and would overrule for the good of his children those terrible agencies? The second is: How did the Jew more than other men learn all this, and may it not have been that God, in his grace and mercy, revealed things and glorious truths to the prophets who taught them? If not, why did not the Jew himself go on to build on Theism the vast fabric of science which has grown up among Western Christian nations? The only possible answers to these questions bring us back to the glorious old truth that all true science, as well as true religion, must emanate from the Father of lights, and from that Divine Word which, coming into the world, lightens every man.

I have now endeavoured to sketch, however roughly and imperfectly, the various shades of ignorance and half knowledge of the Scriptures, and the power of God, from

the dark negation of Spencer and Mill up to the modified Christianity of Muller and Kingsley, and have endeavoured to bring out in contrast to these the grand and simple consistency of the Word of God, which, in its assertion of unity, order, and design in nature, strikes the keynote of all true science and philosophy, and, in its power for the regeneration of man and his return to the family of God, contains all that can make human knowledge really valuable for the true happiness of man. If the Bible does all this in a way plain, historical, and progressive, and through the means of successive prophets in the lapse of ages, this is a method more consonant with the procedure of God in nature, and more suited to the condition of man, than any other. And, finally, I may state, as the conclusion of the whole matter, that the Bible contains within itself all that under God is required to account for and dispose of all forms of infidelity, and to turn to the best and highest uses all that man can learn of nature, if only its truths can be presented in an intelligent and loving spirit, and by the lips of men themselves animated by the Divine Spirit, whose inspiration speaks in the sacred Scriptures. That this may be the high aim of those to whom these lectures have been more especially addressed, is my earnest wish and prayer.



## THE BIBLE FAVORS SCIENCE.

BY REV. DR. HOWARD CROSBY.

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THE conflict between religion and science, and the conflict between the Bible and science, are not equivalent expressions. Religions are manifold; the Bible is one. Religions are largely objective; the Bible in its letter is objective. In its contest with Religion as Religion it has been represented by courts and councils. Science has often gained a decided victory, for she has been the advocate of truth, while Religion was the advocate of error. Such a contrast has often taken place, and in these the world was indebted to science for deliverance from the bondage of superstition and ignorance. But between the Bible and science we may deny that a conflict ever existed. It is common to use this phraseology of antagonism, but it is from a confusion of ideas to which I have alluded. That which has been supposed to be a conflict between the Bible and science, when reduced to its lowest terms, is simply an attack by a few scientific men upon the Bible. These scientific men assault the Holy Scriptures, but the Scriptures make no counter attack on science. The Bible is on the side of science. It is my purpose here to show, in a very brief and imperfect way, I know, that the Bible is a scientific book, and that, therefore, if any scientific men attack the Bible, it must be from some other motive than the love of science. What those motives are, perhaps the Bible itself might tell.

1. The first fact to which I would call

your attention is this, that the men who have held the Bible as their guide, and who have revered it as the word of God, have been the founders and fosterers of modern science. The nineteenth century is marked by brilliant discoveries in all departments of scientific investigation. The heavens have been entered by the bold yet reverent tread of science, and the very glory of the sun analyzed by the spectrum. The material constitution of the planets, the composition of comets, the orbital character of what the common language was wont to call "shooting stars," the magnetic quality of the aurora, the cyclic courses of the winds and the laws of progression for their circles, the formation and dispersion of clouds and the causes and conditions of electric phenomena, have all been with more or less perfectness explained and charted out by the ingenious and devoted energy of earnest searchers after the great truths which lie about us in the realm of nature. The earth, too, has been pierced for its secrets, and its foundations successfully examined for the history of its marvellous construction. The story of ancient races of plants and animals, man perhaps included, has been told us by the unrecorded rocks, and the mind refuses to compute the long, long ages in which the work of earth-building was in process. The sea has been sounded, and its varied floor made visible to the scientific eye; its currents, upper and lower, found to form one harmonious system.

and its inhabitants studied and catalogued as if they were the familiar inmates of a barnyard. Heat, light, and electricity have been tested until their laws, if not their essence, have been understood, and through this knowledge they have been made to minister to man in ways that would have been incredible to our fathers. As discoveries multiply, much more do inventions multiply, for every new principle may have a thousand applications, and so the means of settling and civilizing the whole earth have given our age an energy and growth utterly without a parallel in the history of mankind. Who before these facts can belittle science, or deny her claims to our profound respect and sincere gratitude? Who can doubt that in the advancement of science we are obeying the command given by our Maker to the race at the beginning: "Replenish the earth and subdue it?" Is not a knowledge of the elements of which the material world is composed, and of their laws, a necessary preliminary to that subduing of the whole to which we, as made in the image of God, are commanded? This is the very place of science, and to oppose her is to rebel against God himself.

But whence have proceeded these grand discoveries and inventions of the present age? Have they sprung suddenly from no antecedent? Or, like other human attainments, have they a history of inception and growth? Have they roots in the past—germs which have been nursed into their present fruitage? It will require no very extended research to see that the scientific studies of the modern age have proceeded from the schools that throughout Europe and America stud the land as the bright stars stud the sky. The great investigators have either been college-bred men, or they have used the appliances of colleges and universities for their successful work. From the colleges they received the taste for exploration—the incentive to it. These foster-mothers have been proud of the children, and make them farm their own property. And whence came the colleges and universities? Who founded Prague, and Vienna, and Heidelberg, and Leipzig, and Tübingen, and Jena, and Halla, and

Göttingen, and Berlin, and Bonn? Who founded Salamanca, and Oviedo, and Valladolid, and Oxford, and Cambridge, St. Andrew's, and Aberdeen? I could add scores more of distinguished names in all the countries of Europe—names that are very dear to science, where her streams have been conserved and widened and deepened as the centuries went on. Who, I say, founded these great centres of learning, into which whatever of knowledge Greece and Arabia has gathered flowed as into appropriate homes? The men of the Bible founded them. They were pressed to such grand works just by the impulse of that grand old Book of God. When all the rest of mankind were caring either for the mere necessities of physical being, or for wars of aggrandizement, Bible men were holding up the torch of science, and striving by its light to read and understand the wonderful works of God. In the monasteries even, amid many dark and superstitious souls, it is true, were found the Roger Bacon's who were the predecessors of the Newtons and Boerhaaves and Lavosiers of later ages. It is vain to say they were persecuted. That makes only against their age, not against themselves or the Bible impetus under which they acted. The Universities were always on the side of liberal study, and opposed to the restraints of superstition, and to them, under God, science is indebted for the high ground on which she stands to-day. If the Bible were opposed to science, think you that these things could be?

But again let me ask, Who founded the colleges of America? Who set up these hundreds of schools, where the sciences are carefully taught? Who provided, by endowments and legacies, for continual instruction in every branch of scientific research? Again I answer, Bible men. With a very few exceptions, Bible men did it all—men who honoured the Bible as the source of all wisdom, and who, by imbibing its spirit, provided for their fellow-men.

Now I ask every candid man if it is likely that the Bible can be the enemy of science, or even apathetic with regard to science, and such results as these appear? Are not the

few scientific men who are now attacking the Bible acting an ungracious and ungrateful part?

2. I now turn to another fact: it is this, that the very first scientific minds marked in the annals of science for their discoveries have been Bible men. Sound more than merit attracts attention. One would think, by the blast that is being made in the world just now, that all scientific men must necessarily be arrayed against the Bible. The young and inexperienced are overcome by the clamour, not having yet learned that an empty barrel makes more noise than a full one. And so it becomes necessary for sober-minded men to call attention to some facts that are awkwardly in the way of the misleaders. Newton was only one of hundreds in his day who, given to science, loved and revered his Bible. From Newton's day to this the succession has been complete; not in an attenuated line, but in a broad stream of faithful Bible men; and the science that in our time boasts of its Faraday, its Forbes, its Carpenter, its Hitchcock, its Dana, and its Torrey, certainly cannot be considered as occupying a hostile position towards the Bible. If the Bible is opposed to science, how strange that these acute men, who knew (or have known) the Bible well from constant study, should never perceive it, while it is reserved to others who do not know it at all to make the important discovery? Is there not more boldness than science in such a proceeding? To enlarge on this point would be simply to quote the names of men distinguished in every department of scientific study, who have been no occasional exceptions showing some personal eccentricity which could account for the reverence for the Bible, but in the use of their natural reason, and never suspected by their fellows of any inconsistency in upholding with equal hands the claims of science and the truth of the Holy Scriptures. They were men who had felt the power of the Scriptures in the inner life of the heart; had received the impress of their truth in a region where faith is assurance; had seen the God of truth in the glory of his oracles, and were ready to say, with the late President of Amherst College—himself a scientific

man of no mean rank—"If the supposed results of scientific discovery should be found to be antagonistic to the Bible, I should cleave to the Bible and suspect the results." This deep, inward experimental knowledge hindered not their course of explanation in the realm of external nature, but rather gave it a divine sanction and zeal. To such men the *a priori* argument (which to others would of course be of no value) would have full weight, that the God of truth could not err in his teachings regarding nature, while conveying to man the more important teachings concerning grace. If God declared a way of salvation and a cosmogony, the cosmogony would be as true as the way of salvation, however the two might differ in their relative importance to the individual man and his destiny. If there is an error in the cosmogony, the way of salvation may be rightfully discredited, whether wilfulness or ignorance be cause of the error. A man might be imagined as making a mistake in his physics, and yet being true in his moral philosophy; but a God never. If he err anywhere, he is no God. I say this course of argument is of weight with those who have proved the Bible by its divine heart-touch. Others would deny that God had anything to do with the cosmogony of the Bible, but the Bible heart takes the Bible testimony concerning Moses and all who wrote the books of the Old Testament, that holy men of God spoke as they were moved by the Holy Ghost. The Bible that they revere and love has their endearment by God himself, and they have no eclecticism to use with regard to its entirety. Where no didactic statement is made, they can expect to see phenomenal language used by God and by his inspired prophets, the language which all understand, and the language which scientific men themselves use in their ordinary speech, in using which they render themselves liable to no suspicion of ignorance, since no one finds an argument thereon against the user's scientific character. But when the inspired writer teaches a cosmogony or asserts a historic fact involving scientific elements, when the phenomenal language would be falsehood, the Bible men of science accept the state-

ment as the truth of God. Even in these cases, phenomenal language may be used for the filling up, as in a scientific treatise prepared for the popular understanding; but the main framework of the teaching must be strictly exact. No man would accuse a Leverier of scientific ignorance who should use in his almanac (provided he published one) the phrases "the sun rises" and "the sun sets," or who should say, "when the sun reaches its most northerly point," although, scientifically viewed, these expressions are absurd. Just as absurd is it to accuse the Bible of scientific ignorance because it states that the sun and the moon stand still, or in its ordinary dialogue—poetry or history—uses the popular and unscientific language of the day.

3. A third fact in my proof that the Bible is a scientific book is its express allusion and bold statement as to facts of science which have only lately become known to scientific men. A careful examination of the Holy Scriptures will convince any candid searcher that the God of Nature is speaking in the words of grace—that he who made each atom of matter and each joint in causation is the direct inspirer of phraseology that has no support in the general knowledge of the day, nor in the special knowledge of philosophers, but that has been confirmed by the discoveries made thousands of years afterward by the investigation of Nature and her laws. Let me enumerate a few instances. In the book of Ecclesiastes we have the return of water by evaporation from the sea to the springs expressly stated. "All the rivers run into the sea, yet the sea is not full; unto the place whence the rivers come, thither they return again." No human being in that age was qualified to tell the writer of Ecclesiastes that scientific fact. How did the writer hit on such a record? Was it a happy accident, or did the God of Nature guide his thoughts and pen.

In Psalm xxxix. we read, "My substance was not hid from thee, when I was made in the lowest parts of the earth" (*b'tachtigyoth aretz*, in the under parts of the earth). What man in David's day would have dared trace the elements of

our body beyond the parental source? Who then on earth had so studied the chemistry of life as to find in the upturned strata of the earth the rocks and coals, upheaved from their original beds, the molecular fountains of the human body? It was for science but lately to show to the world how all the elements of nature flow in and out of organisms, and so how every action now existing in my body may once have been in plants and earths and rocks and sea, and from these have been carried into the stream of organization. And yet here in this grand old Psalm of David, written three thousand years ago, this great truth of science is expressly uttered, and the parts of our bodies shown, when they were in the soil and its contents, before they took their position in human generation, and when God in our organic nature was guiding them all through their intricate paths to their destruction.

In the second epistle of Peter we have the uprising of continents from below the surface of the sea told us in the clearest words, a great truth which is supposed by many to have appeared but now among men, and that as the result of scientific researches. When we hear modern science glowingly describe the old liquid *æquor*, and then the Andes rising gradually above it, and then the Alps and Himalaya in their proper order, we are charmed with the picture, and are ready to crown with laurels the learned men who have wrought out this primeval history by patient investigation and comparison; and this is well. All honour to these faithful and successful students of God's grand universe, who have used their observation and logic, as God intended them to be used, for the enlargement of knowledge, the advancement of mankind, and the glory of the Maker. But while we gratefully place these laurels on their heads, let us not forget to go back eighteen centuries, and hear a fisherman of Galilee, taught by the God who made the earth, use this language, not understood when he uttered it, perhaps, even by himself, but now made clear by the labours of science: "By the word of God the heavens were of old, and the earth

standing out of the water and through the water," literally, "the earth out of the water and through the water in the process of getting its consistency."

Because the phrase "foundations of the earth" is frequently used in the Scriptures, it is loosely charged upon the Bible that it recognises the old fanciful idea of a stable, immovable earth, solidly founded on indefinitely deep foundations, in direct antagonism to the fact of its being upheld in space; but this charge utterly fails when we see that the Bible expressly declares of the Maker of all, "He hangeth the earth upon nothing" (Job. xxvi. 7), which is the exact translation of the Hebrew "Toléh eretz 'al b' limáh." So that the Bible phraseology of the earth's foundations is just what would be used in any poetry, though the poet were the most scientific astronomer. In this statement of Job we have another of the numerous evidences of a scientific knowledge finding utterance in Holy Word, which was so far beyond the knowledge of the day that it could only come from Him who was the author of nature.

It has been beautifully shown us by the late discoveries of science that there are asteroidal bodies innumerable pursuing their orbits around our sun, through whose path the earth at times passes, when some of these bodies come within the influence of the earth's attraction and are broken by contact with the earth's atmosphere, and are then precipitated to the earth's surface in stones of larger or smaller size. They are really stars visiting our earth. But did you ever think that the Bible recorded this fact more than thirty centuries ago? When Deborah, the prophetess of God, sang her magnificent psalm of victory over the vast hosts of Jabin and his general Sisera, she singles out one feature of the divine interference in routing the foe, akin to that which sent the hailstones upon the flying army of Southern Canaan in Joshua's day. She sings in her gratitude to God, "The stars in their courses fought against Sisera." Why attribute to a silly astrological superstition what is perfectly explicable on scientific grounds? God made the aerolites to serve his own purpose, and he who directs all the

conjunctions of nature used the asteroidal phenomena to which we have referred in his guardianship of his own people.

It has been common to say that Scripture makes a mistake in speaking of the ant as storing up its food—that in reality it only stores up its eggs; but Col. Sykes discovered at Poonah a species of ants (*Atta providens*) which regularly stores up the seeds of millet for its food in stormy weather. The objectors did not know enough when they corrected the science of Scripture. They have been equally premature when they have objected to the scientific statement regarding the ostrich abandoning its eggs, for late researches have proved that the ostrich quits her eggs during the day, and abandons them altogether if there has been any intrusion upon them, thus furnishing an admirable type of carelessness regarding offspring. These instances of the scientific accuracy of the Bible might be indefinitely multiplied, but I shall content myself in the narrow limits of a lecture to the mention of but one further example. It is a favourite theory with many that the egg was before the animal and the seed before the plant, but this is not a truly scientific view of the matter. We plant an acorn, and it is true there grows up from the seed the branching oak with its mighty limbs and rich foliage. But whence came those limbs and that foliage? From the seed? Certainly not. The oak was never in the acorn. There was a vital principle in the acorn, by whose action, under certain requisite conditions, the materials from surrounding nature were drawn to it, united, and assimilated, so as to make the oak. The oak, we know, was never in the acorn. Could that great bulk have been in the little seed? When that acorn was planted the future oak was lying all around in the other vegetable matter of the earth. Now, then, if the analogy of growth, as we see it, requires not only the seed, but a surrounding field of material for that seed to use, how could an original seed have effected anything, when there was no surrounding vegetation? The oak must have been before the seed, the animal before the egg. If we are going back to originals, it is in

this way we must solve the problem. And now what does the first chapter of Genesis say? "And the earth brought forth the herb yielding seed (not the seed yielding herb), and the tree whose seed is in itself (not the seed whose tree is in itself)." What mere human mind would ever have thought of putting it in this way? And yet this is the only way in which a true science can settle the question between the seed and the tree.

4. And this brings me to my fourth fact regarding the scientific character of the Bible, that it supplies the links in the scientific chain which our experimental science would even fail to reach. The analysis of matter is traced to a very wonderful degree of minuteness through the use of the microscope, spectrum and chemical appliances; and also the connections of some of the lower phenomena of causation through which old arts are enriched and new arts created from the wide and yet limited field of human research and discovery. Experimental science always finds itself at last on the border of the great unknown. Conjecture may go further, but science has nothing to do with conjecture, for atomic theories and evolution theories, that have thrown up such a dust of late, have all their standing in the realm of conjecture, where true science never presumes to tread. They are as utterly foreign to science as the South Sea Bubble was to legitimate business. It is one of the strange facts of the day that theories which are as phantom-like as those of the vortices or Symmes's Hole have stalked through our civilized world these few years past, gaining credence and homage among the crowd, because of the robes of science which some clever wags have adroitly thrown around their shoulders. The people have a profound and righteous regard for science, and are very ready to receive all that bears her honoured indorsement, and to such an extent are they loyal that where some old and decrepit theories that have not a grain of science in them, but belong to another department of thought altogether, yet with the name of science daubed upon their brows, the unsuspecting public yield them

an honest reverence. Experimental science, as I said, always finds itself at last on the borders of the great unknown. Whatever is to be known beyond this border cannot be derived from human experiment, for the workings are in a sphere where no human sense has play. And conjecture is only a slight veil for disappointment, and brings no satisfaction to the mind. What then? Are we to know nothing beyond? Is experimental science the all of science? Has she no other expounder than human observation? Can no one tell what we cannot tell ourselves? Is there no friend in all this vast universe to help us out of our ignorance? Why cannot some higher intelligence whisper into our ears the secret that lies beyond our own sense-perceptive? There must be something above us. Why does it not give us light? Now in answer to such natural queries and querimomes stands the Bible, the Book of God. For thousands of years it has been the bright lamp to the feet of millions of our race. It has carried in its rays the testimony of its divine character, enlightening the eyes, converting the soul, renewing the life. No such strong evidence for any fact cognizable to man can be gathered as the evidence for the Divine authorship of the Bible. All modern civilization rests on the Bible. All the discoveries and appliances of art and philanthropy for the elevation and well-being of mankind which made modern civilization so contrasted with the pseudo-civilization of Assyria, Babylon, and Egypt, sprang from the Bible. Wherever the Bible goes, there are established law and order, the rights of men, and the influences of human sympathy. And when it comes to the individual heart, there spring up personal peace and joy, a holy satisfaction before God, and desires after purity and truth; myriads of witnesses point to the Bible and say, "Thence came our new life." Now this overwhelming testimony cannot be brushed away by a contemptuous sweep of the arm. A scientific mind must regard all facts and admit all honest testimony. And it is this Bible, thus evidenced from without and from within, that completes our science by revealing from a higher intelli

gence those upper links in the chain of causation that human experiment never could reach. It controverts nothing that we have discovered, but it complements our discoveries with a divine revelation. It shows the beginning of causation in the divine purposes of grace, and allows no breach between the Creator and his creation. By such splendid imagining as we now quote it conveys to our minds the grand truth of God's superintendence of all the movements of this commingled nature. "He holdeth the winds in his fist; he ruleth the raging of the sea; he rideth upon the heavens; he fieth upon the wings of the storm; he measureth the waters in the hollow of his hand, and meteth out heaven with a span, and comprehendeth the dust of the earth in a measure, and weigheth the mountains in scales; he drieth up the sea and maketh the rivers a wilderness." In this way the Scriptures refer all the changes which our experimental science correctly classifies, and whose proximate condition it carefully notes, to the ever watchful providence and intelligent guidance of the Supreme Maker of all. The grandest movements of nature and the smallest events in its history are alike decided by his presence and power. He establishes the stars in their paths, and not a sparrow falls to the ground without him.

Besides this governing and guiding presence, the Bible reveals another link in the chain of material causation: it shows back of the power the Divine heart of grace; it declares that all things work together for good to them that love God. It thus puts a soul and an emotion in all the varied interlacing of material phenomena: God the Almighty Creator and his infinite love. Nature is no more a fragment—it is complete. It is no more a blind fatality, but a designed adaptation in its every part. It is no more a cold corpse, but all alive with

the pulsations of the heart of God. And is not this revealed truth concerning nature far more important to us than all else which our experimental science can elicit? Does it not furnish rest both for mind and heart where experimental science would utterly fail? Does it not satisfy the cravings of our souls, which cravings were made to expect this very revelation from our God? And is not our real triumph over nature gained when we can look around on all the grandest and most awful features, and say in calmness, "My Father made them all; his hand upholds and guides them all"? Such, then, is my fourth and last fact regarding the scientific character of the Bible—that it supplies the links in the scientific chain which our experimental science would ever fail to reach.

I leave the subject with the confident expression that our experimental examination of nature's attractive field will always be the best performed by the devout mind that recognises God and his Word in the investigation. The mind that is in harmony with the grand whole of creation, from the Creator's hand down to the last combination of his works, will be guarded against extravagance in the use of false inductions, and will find a principle of symmetry, where else were arbitrary law or wanton movement. To eliminate God from his creation, and to keep from view the power that formed in the action of his formations, is to accept a position at war with fundamental reason, which cordially echoes the words of Scriptures, "He that planted the ear, shall not he hear? He that formed the eye, shall not he see?" Then has science her fairest aspect when, in the light of God's revelation, she performs her high task as an act of worship to him, and lifts her eye from every new discovery in nature's cunning mechanism, saying, "In wisdom thou hast made them all."



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